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Calendar
of
Queen's University
Kingston, Canada



FACULTY OF SCIENCE

(SCHOOL OF MINING)

1916-1917

This Calendar is for the use of those intending to take Courses in Applied Science or Engineering.

For *Arts* and *Theology* Calendars write G. Y. Chown, B.A., Kingston, Ont.

For *Medical Calendar* write Dr. A. R. B. Williamson, Kingston, Ontario.

The *Educational Courses*, under agreement with the Ontario Education Department, are accepted as the professional courses for (a) First Class Public School Certificate; (b) High School Assistant's Interim Certificate, and (c) Specialist's Interim Certificate. For Calendar, write G. Y. Chown, B.A., Kingston, Ontario.

For lists of students, scholarships and prizes and pass lists, all Faculties, see Queen's University complete Calendar.

Copies of the Calendar (twenty-five cents) and of Examination Papers (fifty cents), may be obtained on application to the Registrar, Kingston, Ontario. (The charge for postage is twelve cents additional). All enquiries for information regarding courses in Arts, Science, Education and Theology should be addressed to the Registrar.

**Queen's University
Library**

KINGSTON, ONTARIO

Calendar

OF THE

SCHOOL OF MINING

AND

COLLEGE OF APPLIED SCIENCE

QUEEN'S UNIVERSITY

Kingston, Ontario

TWENTY-FOURTH SESSION

1916-1917

KINGSTON.
The Jackson Press
1916.

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1916/17

TABLE OF CONTENTS.

	PAGE
Board of Governors	5
University Senate ..	6
Faculty of Science	6
Calendar	9
Junior Matriculation Examinations	10
Time Table, April Examinations	11
Announcement	12
Expenses of a Course	13
Requirements for Admission	14
Subjects of Matriculation	14
Scholarships	19
Regulations	22
Fees	24
Degrees ..	25
Courses of Study	28
Four Years' Courses	28
Six Years' Courses	39
Subjects of Study	41
English	41
German ..	41
Spanish ..	42
Economics ..	42
Mathematics	43
Physics	44
Chemistry	47
Geology	51

	PAGE
Mineralogy	57
Animal Biology ..	60
Bacteriology ..	61
Mining Engineering	61
Metallurgy	65
Chemical Engineering ..	66
General Engineering	68
Structural Engineering	70
Hydraulic Engineering	71
Railway Engineering ..	72
Municipal Engineering	73
Surveying	74
Engineering Field Work	77
Electrical Engineering	78
Mechanical Engineering	81
Thermodynamics	85
Drawing	86
Descriptive Geometry	87
Shop Work	88
Physical Training ..	89
First Aid Lectures	89
Libraries ..	90
Engineering Society	94
No. 5 Field Company C.E.	95
Queen's Y. M. C. A.	96
List of Graduates	97
List of Students	111

OFFICERS OF ADMINISTRATION.

VISITOR.

HIS HONOUR LIEUT.-COL. SIR JOHN HENDRIE, K.C.M.G., C.V.O.,
Lieutenant-Governor of Ontario

CHAIRMAN OF THE BOARD OF GOVERNORS.....R. CRAWFORD, B.A.
VICE-CHAIRMANJOHN DONNELLY, M.E.

BOARD OF GOVERNORS.

Retire 1916.

B. W. ROBERTSONKingston
H. A. CALVINKingston
R. CRAWFORD, B.A.Kingston
†A. SHORTT, LL.D., C.M.G.Kingston
‡J. DONNELLY, M.E.Kingston
*ALD. J. W. LITTONKingston
*ALD. R. E. KENTKingston

Retire 1917.

T. B. CALDWELLOttawa
JAS. DOUGLAS, B.A., LL.D.New York
M. J. O'BRIENRenfrew
R. W. LEONARD, C.E.St. Catharines
‡C. A. MACPHERSONKingston

Retire 1918.

D. M. MCINTYRE, B.A., K.C.Toronto
J. MCKELVEYKingston
W. F. NICKLE, B.A., M.P.Kingston
†R. W. BROCK, M.A.Ottawa
‡W. G. MILLER, B.A., LL.D.Toronto
CLIFFORD SMITHToronto

Retire 1919.

J. B. CARRUTHERSKingston
N. F. DUPUIS, M.A., LL.D.Kingston
MILTON L. HERSEY, M.Sc., LL.D.Montreal
JAMES SWIFTKingston
†A. LONGWELL, B.Sc.Toronto

Those marked * are appointed by the City Council for one year.

Those marked † are elected by graduates.

Those marked ‡ are appointed by the Ontario Government.

Those not marked are elected by the shareholders.

UNIVERSITY SENATE.

PRINCIPAL GORDON, <i>ex-officio</i> .	*DEAN GOODWIN, <i>ex-officio</i> .
PRINCIPAL ROSS, <i>ex-officio</i> .	DEAN J. C. CONNELL, <i>ex-officio</i> .
VICE-PRINCIPAL WATSON, <i>ex-officio</i> .	DEAN H. T. J. COLEMAN, <i>ex-officio</i> .
DEAN CAPPON, <i>ex-officio</i> .	

Elected Members.

PROF. O. D. SKELTON.	PROF. JAS. THIRD.
PROF. A. L. CLARK.	PROF. A. P. KNIGHT.
PROF. W. T. MACCLEMENT.	PROF. E. RYAN.
*PROF. L. W. GILL.	PROF. W. G. JORDAN.
*PROF. S. F. KIRKPATRICK.	PROF. J. DALL.
*PROF. M. B. BAKER.	

*Science representatives on the Senate.

FACULTY OF SCIENCE.

OFFICERS OF INSTRUCTION

WILLIAM L. GOODWIN, B.Sc., D.Sc., F.R.S.C. Alice Street
Professor of Chemistry and Dean of the School of Mining.

D. H. MARSHALL, M.A., F.R.S.E.
Emeritus Professor of Physics.

WILLIAM NICOL, M.A. 203 Albert Street
Professor of Mineralogy.

L. W. GILL, M.Sc. (on active military service)
Professor of Electrical Engineering

S. F. KIRKPATRICK, M.Sc. Union St. W.
Professor of Metallurgy.

J. C. GWILLIM, B.Sc. 173 Union Street West
Professor of Mining Engineering.

A. L. CLARK, B.Sc., Ph.D. 200 Albert Street
Professor of Physics.

M. B. BAKER, B.A., B.Sc., F.G.S.A. 45 William St.
Professor of Geology.

W. P. WILGAR, B.Sc. (on active military service)
Professor of Civil Engineering.

E. A. STONE, Ma.E., M.Inst., C.E. 113 Alfred Street
Acting Professor of General Engineering.

G. L. GUILLETT, M.Sc. 45 William Street
Acting Professor of Mechanical Engineering.

T. S. SCOTT, B.A., B.Sc.
Acting Professor of Civil Engineering.

W. O. WALKER, M.A. 147 Collingwood Street
Associate Professor of Chemistry.

W. C. BAKER, M.A. 135 Centre Street
Associate Professor of Physics.

LEO F. GOODWIN, A.C.G.I., Ph.D., F.I.C. (on active military service)
Associate Professor of Chemical Engineering.

- JOHN WADDELL, B.A., D.Sc., Ph.D. 132 Earl Street
Assistant Professor of Chemistry.
- E. W. HENDERSON, B.Sc. Frontenac Street
Assistant Professor of Electrical Engineering.
- LINDSAY MALCOLM, M.A., B.Sc., O.L.S., D.L.S. .
 (on active military service)
Assistant Professor of Civil Engineering.
- J. M. ADAMS, M.A., Ph.D. 45 William Street
Assistant Professor of Physics.
- D. S. ELLIS, M.A., B.Sc., O.L.S., D.L.S. (on active military service)
Assistant Professor in Applied Mathematics.
- W. A. NEWMAN, B.Sc. 131 Beverley Street
Assistant Professor of Mechanical Engineering.
- A. P. LOTHROP, M.A., Ph.D. 149 Union Street
Assistant Professor of Biological Chemistry.
- J. B. HARVEY, M.Sc. Carruthers Hall
Acting Assistant Professor of General Engineering.
- J. A. MCRAE, M.A., F.I.C. Gordon Hall
Assistant Professor of Chemistry.
- J. K. ROBERTSON, M.A. Albert Street
Assistant Professor of Physics.
- K. F. MATHER, B.S., Ph.D. 55 Lower Alfred Street
Assistant Professor of Geology.
- V. E. POUND, M.A., Ph.D. 125 Centre Street
Lecturer in Physics.
- C. W. DRURY, B.Sc., A.M. (on leave)
Lecturer in Mining and Metallurgy.
- A. M. SQUIRE, B.Sc. Kensington Avenue
Lecturer in Draughting.
- C. S. ALLIN, B.A.,
Lecturer in Mathematics.
- E. T. STERNE, B.Sc. 234 Barrie Street
Lecturer in Chemistry.
- J. O. HALVERSON, B.S., M.A., Ph.D. 43 Ellerbeck Street
Lecturer in Medical Chemistry.
- JOHN A. REID, B.Sc. 44 Clergy Street
Lecturer in Mining and Metallurgy.
- A. F. G. CADENHEAD, B.A. (on active military service)
Lecturer in Chemistry.
- F. ETHERINGTON, L.R.C.P. and S. (Edin.), (on active military service)
 Medical Adviser.
- JAMES G. BEWS Colborne Street
Physical Director.
- J. WADDELL, B.A., D.Sc., Ph.D. 132 Earl Street
Librarian.
- G. Y. CHOWN, B.A. Union Street West
Secretary-Treasurer.

ASSISTANTS AND FELLOWS.

- G. F. DREWRY, B.Sc.,
Assistant in Mechanical and Electrical Engineering.
- J. G. CROSS, B.Sc.,
Assistant in Mineralogy.
- C. L. FREAR, B.S.,
Fellow in Chemistry.
- S. J. WOOD,
Instructor in Shop Work.
- J. H. MOXLEY,
Assistant Physical Director.

DOUGLAS TUTORS, 1915-1916.

- | | |
|------------------|--------------|
| G. R. BELTON. | W. S. ORR. |
| O. D. BOGGS. | E. R. ROBB. |
| R. F. CARNOCHAN. | R. F. SMITH. |
| A. K. LIGHT. | G. WRONG. |
| M. D. NICHOLSON. | |

PROFESSORS OF QUEEN'S UNIVERSITY WHOSE CLASSES ARE ATTENDED BY STUDENTS OF THE SCHOOL OF MINING.

- English*.....J. F. MACDONALD, M.A.
- Botany*.....W. T. MACCLEMENT, M.A., D.Sc.
- Animal Biology*.....A. P. KNIGHT, M.A., M.D.
- German*.....JOHN MACGILLIVRAY, Ph.D.
- French*.....P. G. C. CAMPBELL, M.A.
- Mathematics*.....{ D. BUCHANAN, M.A., Ph.D.
 C. F. GUMMER, M.A.
- Economics*.....{ O. D. SKELTON, M.A., Ph.D.
 W. W. SWANSON, M.A., Ph.D.
- Bacteriology*.....PROF. W. T. CONNELL, M.D.

CALENDAR.

1916.

- June 12—Junior and Honour Matriculation examinations begin at the University and at every Collegiate Institute and High School in Ontario.
- Sept. 1—Applications, stating subjects and accompanied by fee, for Supplemental Pass examinations to be made to the Registrar.
- Sept. 1—Shop Work for Courses F and G begins.
- Sept. 5—Supplemental Junior Matriculation Examinations begin.
- Sept. 17—Supplemental Pass Examinations begin.
- Sept. 27—Classes open (1st term), at 8 a.m.
- Sept. 29—Last day for registration without extra fee.
- Oct. 16—University Day.
- Oct. 31—Last day for registration.
- Dec. 20—Christmas Holidays begin at 5 p.m.

1917.

- Jan. 3—Classes re-open (2nd term) at 8 a.m.
- Feb. 21—Holiday (Ash Wednesday).
- Mar. 15—Last day for receiving notices for Engineering Field Work I.
- Mar. 20—Last day for receiving manuscripts and essays for prizes.
- Mar. 22—Last day for receiving applications and fees for examinations and graduation.
- Apr. 3—Classes close at 5 p.m.
- Apr. 4—Examinations begin.
- Apr. 6—Good Friday.
- Apr. 15—Last day for receiving fees for Engineering Field Work I.
- Apr. 23—Meeting of Faculty to consider reports of examiners.
- Apr. 25—Convocation for distributing prizes, announcing honours and conferring degrees.
- Apr. 29—Engineering Field Work I. begins.

TIME-TABLE OF EXAMINATIONS.

April, 1917.

	A.M.	P.M.
April 4.....		Economics I.
April 5.....	Astronomy.....	Desc. Geometry.
	Electrical Eng. I.....	Mun. Eng. IV.
	Electrical Eng. III.....	Electrical Eng. VI.
	Phys. Chem. III.....	Mechanical Eng. V.
		General Chem. III.
April 7.....	Physics I (Mechanics).....	Mineralogy I.
	Elect. Eng. II.....	Geology VII.
	Geol. III.....	Phys. Chemistry II.
	Survey. IV & Struct. Eng. I.	Electrical Eng. IX and XI.
	Indust. Chemistry I.....	Gen. Eng. V & Ind. Chem. II.
April 9.....	Gen. Chemistry I.....	Gen. Chem. II.
	Phys. Chem. I.....	Chemical Eng. II.
	Hydraulic Eng. I.....	Ry. Eng. II & Struct. Eng. II.
		Anal. Chem. VII.
April 10.....	Math. I., Trigonometry.....	Mathematics II.
	Gen. Eng. VI.....	Railway Eng. III.
	Mining I.....	Mining II.
	Physics IV.....	Mechanical Eng. VIII.
	Organ. Chem. II.....	Organ. Chemistry III.
April 11.....	Mechanical Eng. VII.....	Physics II.
		Biology.
		Economics II.
April 12.....	Surveying I.....	Geology I.
	Gen. Engineering II.....	Geology VI.
	Geology II.....	Mechanical Eng. IV.
		Physics III.
April 13.....	Math. I., Geometry.....	German
	Railway Eng. I.....	General Eng. I.
	Ore Dressing.....	Struct. Eng. IV.
		Thermodynamics III.
		Chemical Eng. I.
		Mineralogy VI.
April 14.....	Physics I, Sound, Light, Heat	Organic Chem. I.
	Elect. and Mag.....	Surveying VI.
	Thermodynamics II.....	Surveying II.
	Geology V.....	Electrical Eng. VII.
		Electrical Eng. VIII.
		Geology VIII.
		Municipal Eng. II
April 16.....	Math. I., Algebra.....	Mathematics III.
	Metallurgy I.....	Electrical Eng. V.
		Mechanical Eng. VI.
		Metallurgy II.
		Geo. IX & Municipal Eng. III.
April 17.....	Jr. English.....	Mineralogy III and IV.
	Mech. Eng. II.....	Hydraulic Eng. II.
	Surveying VII.....	Metallurgy III.
	Structural Eng. III.....	Mechanical Eng. IX.

ANNOUNCEMENT.

The School of Mining and College of Applied Science is a branch of the *School of Mining and Agriculture*, incorporated in 1893 by Act of the Legislature of Ontario. It is affiliated to Queen's University, which confers all degrees.

While originally a Mining School it has been expanded to include courses of study for degrees in mining and metallurgy, in civil, mechanical, electrical and chemical engineering, in analytical chemistry and assaying, and in geology and mineralogy. The objects of the institution are to provide thorough instruction, both theoretical and practical, in these and other branches of applied science, and to adapt courses of study and methods of presentation to the conditions prevailing in Canada, so as to secure as nearly as may be a maximum usefulness to the country.

Kingston is well situated as the seat of a college of engineering and applied science. Geology and mineralogy, two of the fundamental subjects of a mining engineer's education and also important in other scientific professions, are studied to best advantage where the minerals can be seen as they lie in nature, and where geological formations can be examined *in situ*. In a few hours a class of students can be taken by carriage to a region so rich in mineral species that about forty different kinds have been secured in an afternoon. There are several geological formations out-cropping within easy walking distance of the city. If to this be added the accessibility by a short railway journey, of mines in operation, the opportunities for instructive demonstrations to classes in mineralogy, geology, and mining are very numerous. The metallurgical works at Deloro, eighty miles from Kingston, are also open to our students. It is thus possible to give to the study of mineralogy, geology, mining and metallurgy, that practical turn which not only adds interest to the college course, but shortens the period between graduation and the attainment of proficiency and confidence in professional work.

The variety of topographical features in the surrounding country affords the best of material for practice in all branches of surveying, including railway, topographic, hydrographic and land surveying. The main line of the Grand Trunk passes through the city

limits and Kingston is a terminus of branches of the Canadian Pacific and Canadian Northern Railways. The Canadian Locomotive Works, which are the largest locomotive shops in Ontario, are within ten minutes walk of the School of Mining, and are open to our students for study and for assisting in engine testing and similar work. Kingston has two Dry Docks, one of which, the large Dominion Government Dock, is now under lease to the Kingston Ship Building Co., in whose yards steel construction can be practically studied. The locks of the Rideau Canal can be visited at Kingston Mills, six miles from the heart of the city. There are also several water powers within easy distance, some of which are as yet awaiting development, while others can be seen in use at Gananoque (18 miles distant), at Trenton (60 miles distant), and at other points. Students of civil, mechanical and electrical engineering thus have easy access to practical illustrations of their professional studies.

EXPENSES.

The following statement of expenses for a session is made from information obtained from students who have kept an account of their expenditures. Personal expenses are not included in the estimates. The average expense for class fees is included in this estimate:

Class and other fees	\$100.00 to \$125.00
Board, lodging and washing	120.00 to 180.00
Books and Stationery	15 00 " 25 00
*Incidentals	10.00 to 20.00
Excursions (geology, mineralogy and mining).....	8 00 " 12 00
	<hr/>
	\$253.00 to \$362.00

The average student pays for board from \$3.25 to \$3.75 a week; and room from \$1.25 to \$2.00 a week. A few pay as little as \$4.00 for board and room; while others, with more expensive tastes, pay \$6.00 or more. Anyone, however, may count on finding satisfactory board and lodging at from \$5.00 to \$5.25 a week.

*Subscriptions to students' societies, hospital ticket, etc., but no personal expenses are included in incidentals.

The fee for graduation is not included in the estimate.

HOSPITAL PRIVILEGES.

The Governors of the Kingston General Hospital agree to give those students who take out Hospital Tickets (cost \$2) all the advantages of a private room, including room, board, attendance of nurses in training, and ordinary medicines, when requiring medical or surgical treatment, from October 1st to May 1st. These benefits are conditional on 250 students taking out tickets by November 1st.

REQUIREMENTS FOR ADMISSION.

Every regular student is required to pass the matriculation examination or an equivalent thereto before being admitted to examinations leading to a diploma or degree, and must follow one of the courses hereafter mentioned. (See page 28).

A candidate for admission as a regular student must qualify in accordance with one of the following standards:—

(1) Pass the Normal Entrance or Junior Matriculation Examinations of the Department of Education of Ontario in the subjects of English Composition, English Literature, History (British and Canadian), together with any two of the following: Latin, Greek, French, German, and Experimental Science; also obtain pass standing on the Honour matriculation examination in Mathematics (Algebra, Geometry, Trigonometry). The pass standard for each paper is forty per cent. of the marks assigned to it, but the average marks obtained on the Junior Matriculation papers must be sixty per cent., with such modifications or exceptions as may be deemed proper in consideration of the total number of marks and the reports of the Principals.

For syllabus of work covered by the examination see pamphlet on Matriculation issued by Queen's University, a copy of which will be sent upon application to the Registrar.

A candidate who has obtained the average of sixty per cent. on all the papers but has failed to obtain forty per cent. in one or two or at most three of these papers, may complete Junior Matriculation by passing on these papers at any one subsequent examination.

A candidate who has obtained forty per cent. on each of at least eight papers with an average of sixty per cent. will be credited with these papers. In order to complete Matriculation he must

obtain at one subsequent examination forty per cent. on each of the remaining papers with an average of sixty per cent.

(2) Pass equivalent examinations or otherwise gain equivalent standing. Candidates receive *pro tanto* standing only under this clause.

Such Examinations are:—

Prince Edward Island ...	First Class Teachers Licenses. Second and Third Year Certificates of Prince of Wales College.
Nova Scotia	Grade XI with Mathematics of Grade XII.
New Brunswick	Class I with Mathematics of Superior School Class.
Quebec	Academy Grade III. University School of Leaving Certificate.
Manitoba	Grade XI Engineering Matriculation with Mathematics of Grade XII.
Saskatchewan	Middle Form with Mathematics of Senior Form.
Alberta	Grade XI with Mathematics of Grade XII.
British Columbia	Intermediate Grade with Mathematics and Science of Senior Grade.

NOTE.—A certificate from any school which is on the list of schools approved by any University or Technical College of recognized standing in the United States will be accepted as equivalent to matriculation examinations *pro tanto*.

NOTE.—Candidates without Honour Matriculation in Mathematics, who wish to enter on a B.Sc. Course, may do so by taking at the University a preparatory year's work which would include the following subjects,—Junior English, Junior Mathematics, Junior Physics and Junior French or Junior German.

III. Students who have already taken, in a University *arts or science faculty* or in a recognized technical or military school, subjects included in a course in the School of Mining will, on entering upon a course for the degree of B.Sc., be admitted to the year for which they are qualified.

Graduates of Royal Military College will be allowed two years of the four year courses for a degree in the School of Mining.

IV. A candidate who is actually engaged in a mercantile, industrial, or other occupation may proceed to pass Junior Matriculation under the following conditions:—

(a) He may present himself for one or more subjects at any July or September Examination.

(b) At any such Examination he will receive credit for a subject or subjects on obtaining 40 per cent. in each paper and an aggregate of 60 per cent. of the total marks assigned to such subject or subjects. There are two papers given in each subject.

(c) Matriculation must be completed under these conditions within four consecutive years.

In order to secure credit for the subject or subjects written, a candidate who desires to matriculate under these regulations must, immediately on receipt of his Departmental statement of marks, return the same to the Deputy Minister of Education accompanied by a certificate from his employer to the following effect:—

.....191....
I,.....do hereby certify that.....
was in my employ from.....to.....in the
capacity ofand that this employment made it
impossible for him to attend the regular day sessions of a secondary
school. My business is that of
located at

Give business address in full

.....
Signature in full

To the Deputy Minister of Education.

V. SUPPLEMENTAL MATRICULATION.—The Supplemental Pass Junior Matriculation examination is conducted by the Department of Education for the University Matriculation Board, at the following centres:—

(a) The University of Toronto; Queen's University, Kingston; McMaster University, Toronto; Western University, London.

(b) Any of the following, upon request:—Windsor, Chatham, Sarnia, St. Thomas, London, Woodstock, Brantford, Simcoe, Cayuga, Welland, St. Catharines, Hamilton, Goderich, Stratford, Berlin, Guelph, Walkerton, Owen Sound, Orangeville, Barrie, Whitby,

Bowmanville, Cobourg, Lindsay, Peterborough, Belleville, Picton, Napanee, Brockville, Kemptville, Prescott, Morrisburg, Cornwall, Alexandria, Vankleek Hill, Ottawa, Smith's Falls, Renfrew, Bracebridge, North Bay, Sault Ste. Marie, Port Arthur, Haileybury.

(c) Elsewhere in Ontario, upon request, and if approved by the University Matriculation Board.

(d) Elsewhere in Canada, upon request of one of the afore-said Universities and approval of the Board.

2. Applications to write on the examinations, accompanied by the necessary fee, will be received at the Department of Education as follows:—

(a) Up to September 1st, from those who wish to write at any centre authorized in Ontario.

(b) Up to August 25th, from those who wish to write elsewhere in Ontario.

(c) Up to August 1st, from those who, through one of the afore-said Universities, make application to write outside of the Province of Ontario.

3. On payment of the required fee with one dollar additional, a candidate who has failed to make application as specified in the foregoing regulation (2) may be admitted to examination at a centre already established, provided the accommodation is adequate and the number of question papers is sufficient.

4. The subjects of the examination, the prescription of work and the standard required shall be the same as for the annual Pass Junior Matriculation examination of the same year.

5. The following are eligible to become candidates at this examination:—

(a) Those who are applicants for the complete Matriculation examination.

(b) Those who are completing this examination under the regulations in force in any previous year.

(c) Those who are applicants for matriculation standing in certain subjects.

6. Candidates who present themselves under 5 (a) and pass the complete examination for Matriculation in any one year will be granted Departmental certificates of Pass Junior Matriculation. All other candidates will receive statements of their standing.

7. Other candidates than those mentioned in 5 may be admitted to the examination for the purpose of qualifying for a standing other than that of Departmental Matriculation.

8. (a) Candidates may write at any one of the four University centres mentioned in 1 (a) without any additional cost to themselves.

(b) Candidates who write at any other centre, in addition to paying the fee required in (9), must also defray the local expenses of conducting the examination. These include the cost of supplies, any charge for the examination room, express charges, and the allowance to the presiding officer at \$4 per day.

9. The fee for writing on the Supplemental Examination shall be \$2.00 for each paper or half paper, with a maximum fee of \$10.00.

10. The regular uniform examination books shall be used at this examination, and the examination shall be conducted, *mutatis, mutandis*, under the instructions governing the annual Midsummer examinations.

11. Forms of application, the time-table of the examinations, and further particulars may be obtained on application to the Department of Education, Toronto.

VI. SPECIAL STUDENTS.—Students not proceeding to a degree may take any classes for which they are prepared. The work in Chemistry, Mineralogy, Geology, Drawing, Surveying, etc., is so arranged that those who wish to study these subjects, either for their scientific interest or as leading to professions other than engineering, may profitably pursue their studies here.

The Faculty will admit under this paragraph, as special students, only such candidates as it regards specially fitted to take part of the classes of a course, by virtue of mature age, or other special circumstance. It will not admit as special students those whom on account of previous poor records, it is no longer desirable to continue as regular students.

SCHOLARSHIPS AND PRIZES.

1. EXHIBITION OF 1851 SCIENCE RESEARCH SCHOLARSHIP.

This scholarship, of the annual value of £150 stg., is awarded by Her Majesty's Commissioners for the Exhibition of 1851 to students who have given evidence of capacity for original research, and (except in very special circumstances) are under 30 years of age.

The nominee must be a British subject, must have been a *bona fide* student of Queen's University for three years, must have been a student of this University for a full year immediately before his nomination, must be a student of the University at the time of his nomination, (or he must have been a student at this University for a full year ending within twelve months prior to his nomination and since ceasing to be such student must have been engaged solely in scientific study) and must pledge himself not to hold any position of emolument whilst holding the scholarship. He is recommended to the commissioners by the Senate of the University. The scholarship may be held for a second year, if the report of the first year's work be satisfactory to the Commissioners. The scholar will, in the absence of special circumstances, be required to proceed to an institution other than that by which he is nominated, and there pursue some investigation likely to promote technical industries or scientific culture. The particular investigation the student proposes to pursue must be stated before a scholarship can be awarded.

Students of the School of Mining who are registered in Queen's University are eligible for this scholarship.

The next recommendation will be made by the Senate in April, 1917.

Science Research Scholars recommended by Queen's University:

Norman R. Carmichael, M.A., 1893-94.

Thomas L. Walker, M.A., 1895-6.

Frederick J. Pope, M.A., 1897-8.

Wm. C. Baker, M.A., 1900-1.

C. W. Dickson, M.A., 1901-2-3.

C. W. Knight, B.Sc., 1904-5.

F. H. MacDougall, M.A., B.Sc., 1905-6.

C. Laidlaw, B.A., M.D., 1907-8.

N. L. Bowen, M.A., B.Sc., 1909-10.

Walter A. Bell, B.Sc., 1911-12.

J. R. Tuttle, M.A., 1913-14.

R. C. Cantelo, B.Sc., 1915-16.

2. THE CHANCELLOR'S PRACTICAL SCIENCE SCHOLARSHIP.—Value \$70. Given by Sir Sandford Fleming, C.E., K.C.M.G., LL.D., Chancellor of the University. Awarded to the student of the School of Mining obtaining the highest average on the examinations at the end of the first year.

3. THE J. B. CARRUTHERS SCHOLARSHIP.—This scholarship, of the value of \$50, the gift of J. B. Carruthers, Esq., of Kingston, is awarded annually to the student of the first year who makes the second highest average of marks in the subjects of the first year.

4. MOWAT SCHOLARSHIP.—Value \$50. Given by Ex-Mayor Mowat. Awarded to the student of the School of Mining who obtains the highest average on the examinations at the end of the second year.

5. CANADIAN MINING INSTITUTE PRIZES.—Premiums and prizes, at the discretion of the Council, may be given annually for papers read by students during the year. Any such award shall be made by the Council within three months after the Annual Meeting.

6. ENGINEERING SOCIETY PRIZES.—The Engineering Society of Queen's University offers two prizes of \$15.00 and \$10.00 for the two best papers on scientific subjects, by members of the society. These papers must be read before the society, and five papers, at least, must be presented before the prizes will be awarded. These prizes are open for competition to all students of Engineering.

7. THE M. L. HERSEY FELLOWSHIP IN CHEMISTRY.—This Fellowship of the annual value of \$500, has been endowed by Milton L. Hersey, M.Sc., LL.D., of Montreal. It is open to graduates of all universities and technical colleges. The holder of the Fellowship is expected to assist in the department of Chemistry and to devote part of his time to research.

Applications addressed to the Secretary of School of Mining, Kingston, Ont., stating qualifications and enclosing recommendations will be received up to July 31st.

8. THE DOUGLAS TUTORSHIPS.—At the beginning of session 1910-11 a gift from Dr. James Douglas, of New York, led to the establishment of a system by which first year students were tutored by men selected from the senior years. The complete success of the work led to the extension of the system to include the more difficult classes of the second year. The instruction is given in the evening and as each tutor gives his whole attention to not more than five students in a period, the result is that of individual teaching.

9. THE SCIENCE '11 SCHOLARSHIP.—The Science '11 Scholarship will be awarded in accordance with the following regulations:—

(a) Each department shall value—as a percentage—the term work of each student in each class of the second year as given in the syllabus of the courses in the calendar.

(b) Each department shall be free to employ whatever methods it may find most suitable in the determination of the value of the term work of the various students.

(c) The scholarship shall be awarded by the Faculty to the student whose average percentage shall be found to be the highest; it being understood that this average has been taken all over the second year classes of the particular course for which the student is registered.

10. THE N. F. DUPUIS SCHOLARSHIP.—This scholarship has been founded by the graduates as a mark of their appreciation of the long and effective services of Dr. N. F. Dupuis, as Dean of the Faculty and Professor of Mathematics. The scholarship is of the value of \$60, and is awarded to the student who makes the highest marks in Mathematics I (including Descriptive Astronomy) at the April Examinations.

11. THE A. E. SEGSWORTH PRIZE.—This is a prize of the value of \$50 founded by R. F. Segsworth, Esq., Toronto, in memory of his brother, A. E. Segsworth, B.A., Ph.D. The prize is awarded to the student of any year who hands in before December 1st the best account of his previous summer's experience in practical underground mining.

REGULATIONS.

N.B.—Students taking a regular course are subject to all rules and Regulations immediately upon publication, unless otherwise specified.

1. REGISTRATION.—All students are required to register and pay the registration, athletic and class fees within three days of the opening of the session. A student who fails to register within this time must pay an additional fee of \$3.00. No student proceeding to a degree will be allowed to enter upon the work of a session after October 22nd, except that under special circumstances students may be admitted to the first year after October 31st.

2. ATTENDANCE.—Students are required to attend seven-eighths of class lectures before permission will be given to write on examinations, and seven-eighths of laboratory hours before laboratory work will be certified. Exemption from this rule can be obtained only on application to the Faculty.

3.—COURSES.—All students must take the subjects required in their courses in conformity with the calendars of their years of attendance. If a student wishes to change his course he must first obtain the permission of the Faculty.

4. SESSIONAL EXAMINATIONS.—All examinations for degrees are held under the direction of Queen's University. Candidates must make application for permission to write on such examinations, on forms supplied by the Registrar. Fees for the April examinations must be paid to the Registrar not later than March 23rd, and for the supplemental examinations not later than September 1st. Sessional examinations are held in all the subjects prescribed in the various courses, 40% being required for pass standing. In determining a student's standing at a sessional examination, professors are empowered to take into account his entire class record.

Regular students must take the April examinations in all subjects in which they are registered and in which these examinations are held. Failure in more than four classes, including practical classes in which no written examinations are held, involves the loss of the session. A student failing in not more than four classes

is given supplemental examinations in the following September; if he fails in more than two of these examinations he must repeat the whole work of the year except those subjects in which his standing is second division (55 p.c.) or higher. A student shall not enter the third year until he has passed all the examinations of the first year; nor the fourth year until he has passed all the examinations of the second year. In this connection each of the four sections of Mathematics I counts as one class, and *each* of the two sections of Physics I as one class, and all other classes count as one each. Engineering Field Work I is regarded as a second year class and comes under this regulation both in respect to back classes and admission into the fourth year.

5. CHRISTMAS EXAMINATIONS.—Examinations will be held for first year students on the last four days before the Christmas vacation, under the same conditions as the April examinations, except that the examinations will be restricted to two hours each. Any student failing to secure 40 per cent. in more than four of these examinations shall be refused admission in the following spring term, half class fees being returned.

Examinations in all classes of the second year will be held during the last week of the first term or such time as may be necessary. Every second year student must write the examination in each class which he attends, each examination to be restricted to two hours. The marks given in these examinations will count 25 per cent. of the total for the year.

Examinations are held in certain subjects of other years, which are duly announced. The marks for these examinations may amount to as much as 25 per cent. of the total for the year.

6. PRACTICAL WORK.—Students are required to take the practical courses given in the calendar unless they have followed similar courses in other educational institutions, but instructors may, at their discretion, modify the work in the case of students who have had experience in the field, in engineering works, etc. Such students may be set immediately at more advanced work than that required of those who have not had such experience.

7. EXCURSIONS.—The excursions are compulsory for all students in Mineralogy and Mining. (See Field Classes in Geology and Prospecting).

8. A candidate for a degree in one of the four years' courses must make application and pay the graduation fee to the Registrar of the University before March 23rd. If the candidate fails in his examination the fee will be returned.

9. GRADUATION WITH HONOURS.—Honour standing will be given to any student who graduates with an average of seventy-two per cent. or upwards upon the whole of the fourth year work in his course. Credit for Honour standing will be given on the diploma and in the list of graduates a mark of distinction will be placed with the names of those graduating with Honour standing.

10. EXTRA-MURAL STUDENTS.—Students who are not able to attend the School may register in the classes of Junior English, Junior and Senior Chemistry, Elementary Mineralogy and Geology, as extra-mural students of Queen's University (see Arts Calendar. Tutors are appointed to assist them by correspondence.

11. FEES.—Laboratory fees must be paid before students begin work in the laboratories. Examination, degree graduation, *ad eundem statum*, and University registration fees, are payable to the University Registrar. All other fees are payable to the Treasurer of the School of Mining. Graduation and Spring examination fees must be paid before March 23rd; supplemental examination fees before Sept. 1st.

Registration, class, athletic and Engineering Society fees are payable within the first three days of session.

Registration for Students of the School of Mining.....	\$10 00
Registration for Arts and Medical Students.....	1 00
Engineering Society	2 50
Athletics	3 00
Students failing to register within three days of opening of session must pay an extra fee of.....	3 00
Change of classes after registration.....	2 00
Certificate of Standing	1 00

FEES FOR A COURSE.

These fees cover all class and laboratory fees for a course.

Per Session, First Year Students.....	\$75 00
Per Session, Second Year Students.....	85 00
Per Session, Third Year Students	95 00
Per Session, Fourth Year Students.....	95 00

FEES FOR SINGLE CLASSES, &c.

These are not additional to the sessional fees.

Any course of Lectures	\$12 00
Drawing, One Course, per Session.....	12 00
Surveying, One Course, per Session.....	12 00
Assaying Laboratory, per Session.....	5 00
Chemical Laboratory, per Session	15 00
Petrographical Laboratory, per Session	5 00
Mechanical and Engineering Laboratory, per Session.....	15 00

GRADUATION AND OTHER FEES.

Graduation B.Sc.	\$20 00
“ M.Sc.	20 00
“ D.Sc.	50 00
“ Diploma, three years' course.....	10 00
Admission <i>ad eundem statum</i>	10 00
Examination Fee, April, September, or Special	10 00

DEPOSITS. — For covering expenses of breakages, etc., a student must deposit \$5 with the Treasurer. If at any time the amount of breakages, etc., exceeds \$3, an additional deposit of \$5 must be made. Charges will be made for the use of platinum, and specially expensive chemicals and apparatus. All money to the credit of the depositors will be returned at the end of the session on presentation of the deposit receipt properly certified.

DEGREES.

1. The degree of B.Sc. will be given at the satisfactory completion of a four years' course in any one of the following departments:—

- (A) Mining and Metallurgical Engineering.
- (B) Analytical and Applied Chemistry.
- (C) Mineralogy and Geology.
- (D) Chemical and Metallurgical Engineering.
- (E) Civil Engineering.
- (F) Mechanical Engineering.
- (G) Electrical Engineering.

2. The degree of B.A. and B.Sc. will be given at the satisfactory completion of a six years' course in Arts and Science according to the description on page 39.*

A CANDIDATE FOR GRADUATION must have completed either a four or a six years' course and have passed all the required examinations.

A graduate in any course who desires to take the degree of B.Sc. in any other course, or a student desiring to change from one course to another, shall take all the classes which he has not already passed, in that course, or, by examination satisfy the Department in charge of those classes as to his knowledge of the subjects involved.

CERTIFICATES of standing may be obtained from the Secretary on payment of the fee of one dollar.

3. The degree of Master of Science (M.Sc.) is granted to candidates who have graduated as B.Sc. and thereafter:—

a. Have practised their profession for at least two years (one year of which must have been responsible engineering or scientific work).

or *b.* Have spent at least one session in attendance at the School of Mining after graduation as B.Sc.

In either case the candidate must have carried on research work, the results of which must be submitted, on or before March 30th, in the form of a thesis satisfactory to the Faculty. The literary as well as the scientific quality of the thesis is considered.

In addition to this, an examination is required, on subjects kindred to that treated in the thesis. This examination must be written in April. The candidate must give notice of his intention to proceed to the degree at least six months before he presents himself for examination, and must at the same time submit for approval the subject of his research. The subjects for examination will then be assigned by the Faculty.

*The degree of M.A. and B.Sc. may be obtained in seven years in properly selected courses. See page 40.

4. The degree of Doctor of Science (D.Sc.) is granted to candidates who have graduated as M.Sc. or have otherwise satisfied the Faculty of their ability to proceed, and have thereafter fulfilled the conditions which here follow.

The degree is not granted until after at least three years from the time of graduation as M.Sc. unless one session is devoted to research in an approved university or school of engineering or applied science, in which case the degree may be granted at the end of two years from the time of graduation as M.Sc.

The candidate must submit a thesis embodying the results of his original and independent research in some subject of importance to science. The literary as well as the scientific quality of the thesis is taken into account in judging the candidate's fitness to proceed to the examination.

The candidate must make application in writing to the Secretary at least two years before he proposes to present himself for examination, and must at the same time submit for approval the subject of his research. The subjects of the examination, which will be cognate to that of the thesis, will then be assigned by the Faculty, and will include a reading knowledge of either Scientific French or German.

5. B.A. and M.A. courses in Chemistry, Assaying, Mineralogy, Geology, etc. (See Calendar of Queen's University).

DOMINION LAND SURVEYORS.

The Degree in Mining or in Civil Engineering of the School of Mining, Kingston, is equivalent to the "diploma as Civil Engineer" mentioned in Clause III of the Dominion Lands Act; so that a candidate for D.L.S. having that degree from the School of Mining is entitled to examination after one year's service with a D.L.S.

ONTARIO LAND SURVEYORS.

The Ontario Land Surveyors' Act, I Geo. V., C. 41, S. 28.
"The privilege of a shortened term of apprenticeship shall be accorded to any graduate of . . . the School of Mining, Kingston, in Civil Engineering, or in Mining Engineering, and such person shall not be required to pass the preliminary examination hereinbefore required for admission to apprenticeship with a land surveyor,

but shall only be bound to serve under articles with a practising land surveyor, duly filed as required by section 32 of this act, during twelve successive months of actual practice, after which, on complying with all the other requirements, he may undergo the examination prescribed by this Act."

COURSES.

- (A) Mining and Metallurgical Engineering.
- (B) Analytical and Applied Chemistry.
- (C) Mineralogy and Geology.
- (D) Chemical and Metallurgical Engineering.
- (E) Civil Engineering.
- (F) Mechanical Engineering.
- (G) Electrical Engineering.

A.—MINING AND METALLURGICAL ENGINEERING.

This course is necessarily a very broad one, so that it may give a foundation for whatever branch of these professions a graduate may follow. Experience has shown that graduates do not usually follow any narrow differentiation which they make during their course, but are governed by many other factors in the practice of Mining and Metallurgical Engineering. These factors are often out of their control, and the wisest plan in a four years' course appears to be, not to specialize, but by a broad training, in the final years, to obtain a suitable introduction to any branch of the work.

There are, however, some well known avenues towards professional work, such as a good training and a manipulative skill in drafting, chemical analysis, and surveying. These subjects are common, and imperative, to almost any professional position in mining and metallurgy, therefore they are perfected as far as is possible while at college.

At the present time there are no summer classes, or summer field work in mining or metallurgy, excepting the Engineering Field work of the second or third years, which work takes place early in May. Under these conditions the student can, usually, obtain practical and remunerative work, during four or five months each summer. This work, if in connection with Mining, Metallurgy or Sur-

veying is considered to be more useful as a training than practical work under academic supervision.

The degree of B.Sc. is given upon the completion of this course, and evidence of at least six months spent at work in connection with mines, metallurgical works, surveying or geology.

FIRST YEAR.

	Lect. Hrs. per week.	Lab. Hrs. per week.	Page
Junior English	4		41
Mathematics I	8		43
Physics I	4	2	44
General Chemistry I	2	3	47
Drawing I		5	86
Surveying I	1		74
Junior French } (optional)		See Arts Calendar	
Junior German }			41
Physical Drill		2	89

SECOND YEAR.

Mathematics II	3		43
Mathematics III	3		44
Descriptive Geometry	1	2	87
Physics II	2	2	45
Analytical Chemistry I		3	48
Analytical Chemistry III		3	48
General Chemistry II	1		47
Mineralogy I	1	2	57
Mineralogy III	2(b)		59
Geology I	2		52
Drawing II		3	87
Surveying VI	1	3	76
Shopwork		3	88
Engineering Field Work I, April, May			77

THIRD YEAR.

Analytical Chemistry IV		5	48
Mineralogy IV		4	59
Geology II	1(a)	2(b)	53
Geology III	2	2	53
Geology IV	2(a)		54
Geology V	1(b)		54
Mining I	2		61
Ore Dressing	2		62
Metallurgy I	2		65
Fire Assaying		4(b)	66
Thermodynamics I	2(a)		85
General Engineering I	2		68
General Engineering III		2	69
Electrical Engineering I	1(a)	2(b)	78
Surveying VII	1	2	76
Mechanical Engineering VII	1		84
Economics I	1		42

FOURTH YEAR.

	Lect. Hrs. per week.	Lab. Hrs. per week.	Page
Industrial Chemistry II	1		50
Mineralogy VI	1		60
Geology VIII	2		55
Mining II	3		62
Milling		11	63
Metallurgy, Mining and Mill Designing or (Mining and Metallurgy IV)		5	63
Summer Essay			63
Metallurgy II	4		66
General Engineering II	2		68
Hydraulic Engineering I	2		71
Mechanical Engineering IV	2		83
Economics II	1		42

NOTE—The letters (a) and (b) denote first and second terms, respectively.

B.—ANALYTICAL AND APPLIED CHEMISTRY.

This course is intended to prepare candidates to enter upon the practice of chemical analysis, to fit them for positions in the laboratories of metallurgical, mining, food and other manufacturing works; also for the profession of public analyst and for other positions where a thorough knowledge of chemical analysis and mineralogy is required. The first two years are devoted to those subjects that serve as an introduction to the more specialized work of the last two years. The advanced work of the fourth year deals mainly with practice in analysis of the products of those industries that are being developed in Canada at the present time.

FIRST YEAR.

Same as first year *Course A*.

SECOND YEAR.

	Lect. Hrs. per week.	Lab. Hrs. per week.	Page
German	3		41
Mathematics II	3		43
Mathematics III	3		44
Physics III	1	2	45
Analytical Chemistry I		3	48
Analytical Chemistry II	1	2	48
Analytical Chemistry III		3	48
Analytical Chemistry IV		5	48
General Chemistry II	1		47
Organic Chemistry I	1	2	48
Mineralogy I	1	2	57
Mineralogy II	3(a)		58

THIRD YEAR.

	Lect. Hrs. per week.	Lab. Hrs. per week.	Page
Analytical Chemistry V		5	48
Analytical Chemistry VI		5	48
Organic Chemistry II	1	3	48
Physical Chemistry I	1	3	49
Industrial Chemistry I	2	4	50
Physical Chemistry III		2	49
Mineralogy III	2(b)		59
Mineralogy IV		5	59
Geology I	2		52
Metallurgy I	2		65
Economics I	1		42

FOURTH YEAR.

General Chemistry III	1	2	47
Analytical Chemistry VIII		4	48
Physical Chemistry II	1	3	49
Organic Chemistry III	1	2	49
Organic Chemistry IV		4	49
Mineralogy VI	1		60
Bacteriology		2	61
Fire Assaying		4(b)	66
Economics II	1		42
Advanced Work—An option is allowed between A and B.			
A.—General Chemistry IV [including Petrography (4)]		12	47
B.—Organic Chemistry V		12	49

NOTE—The letters (a) and (b) denote first and second terms, respectively.

C.—MINERALOGY AND GEOLOGY.

This course is designed to meet the requirements of students who desire a theoretical and practical knowledge of the constitution and history of the Earth. It furnishes a foundation for the professions of mineralogist, geological surveyor, mining and consulting geologist, and is useful for those who will in any way be connected with the discovery or the development of the natural resources of the country. It forms a good preliminary course for the mining engineer who wishes to understand thoroughly the groundwork of his profession. Since a knowledge of chemistry is essential for proper comprehension of many mineralogical and geological phenomena, considerable stress is laid on this science in the earlier part

of the course. The departments of mineralogy and geology are furnished with well equipped laboratories for the physical and chemical examination of minerals, rocks and ores, and also with collections of illustrative material. While field excursions are made during the session, students are advised to spend the summer vacations in practical field work.

FIRST YEAR.

Same as first year *Course A*.

SECOND YEAR.

	Lect. Hrs. per week.	Lab. Hrs. per week.	Page
Mathematics II	3		43
Descriptive Geometry	1	2	87
Analytical Chemistry I		3	48
Analytical Chemistry II		2	48
Analytical Chemistry III		3	48
Analytical Chemistry IV		5	48
General Chemistry II	1		47
Mineralogy I	1	2	57
Mineralogy II	3(a)		58
Mineralogy III	2(b)		59
Geology I	2		52
Animal Biology	3		60
Surveying VI	1	3	76

THIRD YEAR.

Elementary German	3		41
Analytical Chemistry V		5	48
Analytical Chemistry VI		5	48
Physical Chemistry I	1	3	49
Mineralogy IV		5	59
Mineralogy VI	1		60
Geology II	1(a)	2(b)	53
Geology III	2	2	53
Geology IV	2(b)		54
Geology V	1(b)		54
Ore Dressing	2		62
Economics I	1		42

FOURTH YEAR.

Geology VI	2		54
Geology VII	1	2	55
Geology VIII	2		55
Geology X		2	56
Mining I	2		61
Metallurgy II	4		66
Surveying VII	1	2	76
Economics II	1		42
Advanced Analysis of Rocks with thesis....		20	

NOTE—The letters (a) and (b) denote first and second terms, respectively.

D.—CHEMICAL AND METALLURGICAL ENGINEERING.

In the construction and operation of chemical works and also in metallurgical enterprises in which the processes are of the more complicated kind there are often required the services of a man who combines a thorough knowledge of chemistry with the education of an engineer; but the chemical engineer must have at his command not merely the elements of general engineering, but also a competent knowledge of those materials of construction and the special kinds of plants and processes which are in use in the works mentioned. The course in chemical and metallurgical engineering covers four years of study, the first two of which do not differ materially from those of the courses in Analytical and Applied Chemistry, or Mining and Metallurgy. Specialization begins in the third year, the time being divided between Chemistry, and Civil and Mechanical Engineering. This is continued in the fourth year, which enables a student to specialize in advanced work in Chemistry, Chemical Engineering, Metallurgy, and Electro-Chemistry.

Visits are paid to local and to at least one outside chemical works, at which attendance is required.

FIRST YEAR.

Same as first year *Course A*.

SECOND YEAR.

	Lect. Hrs. per week.	Lab. Hrs. per week.	Page
Mathematics II	3	.....	43
Mathematics III	3	.....	44
Descriptive Geometry	1	2	87
Physics II	2	2	45
Analytical Chemistry I .....	.....	3	48
Analytical Chemistry II .....	.....	2	48
Analytical Chemistry III .....	.....	3	48
Analytical Chemistry IV .....	.....	4	48
General Chemistry II	1	.....	47
Mineralogy I	1	2	57
General Engineering I	2	.....	68
Surveying VI	1	3	76
Drawing II .....	.....	3	87

THIRD YEAR.

Analytical Chemistry V .....	.....	5	48
Physical Chemistry I	1	3	49
Industrial Chemistry I	2	.....	50
Thermodynamics I	2(a)	.....	85
Thermodynamics II	1(b)	.....	85

	Lect. Hrs. per week.	Lab. Hrs. per week.	Page
General Engineering II	2		68
General Engineering III		2	69
Electrical Engineering I	1(a)	2(b)	78
Mechanical Engineering I and III.....	4(a)	3	81
Economics I	1		42
Shopwork		3	88

Option Chemical Engineering.

Organic Chemistry I	1	2	48
Industrial Chemistry I Lab.		4	50

Option Metallurgical Engineering.

Ore Dressing	2		62
Metallurgy I	2		65
Fire Assaying		4(b)	66

FOURTH YEAR.

Physical Chemistry II	1	3	49
Structural Engineering I	2	3	70
Mechanical Engineering IV	2		83
Economics I	1		42

Option Chemical Engineering.

Analytical Chemistry VI		5	48
General Chemistry III	1	2	47
Chemical Engineering I	3		66
Chemical Engineering II		12(a) 8(b)	67
Metallurgy I	2		65
Ore Dressing		4(b)	62
Fire Assaying			66

Option Metallurgical Engineering.

Organic Chemistry I	1	2	48
Industrial Chemistry I, Lab.		4	50
Metallurgy II	4		66
Metallurgical Lab.		3	66
Milling		11	63

NOTE—The letters (a) and (b) denote first and second terms, respectively.

E.—CIVIL ENGINEERING.

In this course the two main divisions of Civil Engineering, namely Surveying and Draughting, on the one hand, and Structural Design and Construction, on the other, receive full consideration. During the earlier years of the course a sound training along engineering lines is given in Mathematics, Physics, Mechanics and other allied subjects, which are essential to the proper education of an

engineer. The student is also made familiar with the use of the various instruments, and by many hours of practical work in the field and draughting room, becomes skilled in the ordinary operations of Surveying. During the same period the foundation work for structural design is laid by courses of lectures in materials of construction, as well as by demonstrations and practical work in the testing laboratories. The second year is closed by two weeks of Engineering Field Work, whereby the student is brought into contact with the problems of railway location, and hydrographic surveying. During the final years more highly specialized instruction and training are given along the lines of the two main divisions, with particular regard to the economic conditions of modern construction. At frequent intervals excursions are undertaken to the quarries, cement works, brick kilns, bridges, railway structures, canals and graving docks, which are to be found within easy distance of Kingston.

FIRST YEAR.

Same as first year *Course A*.

SECOND YEAR.

	Lect. Hrs. per week.	Lab. Hrs. per week.	Page
Mathematics II	3		43
Mathematics III	3		44
Descriptive Geometry	1	2	87
Physics II	2	2	45
Analytical Chemistry VII	1	2	48
Mineralogy V	1(a)		60
Geology I	2		52
General Engineering I	2		68
Drawing II		3	87
Surveying II	2	3	76
Surveying III	½	2½	76
Shopwork		3	88
Engineering Field Work I	Two weeks		77

THIRD YEAR.

Metallurgy I	2		65
Thermodynamics I	2(a)		85
Thermodynamics II	1(b)		85
General Engineering II	2		68
General Engineering III		2	69
General Engineering VI	1	3(b)	69
Engineering Field Work II		3	77
Electrical Engineering I	1(a)	2(b)	78
Railway Engineering I	2	2	72
Hydraulic Engineering I	2		71
Structural Engineering I	1	3	70

	Lect. Hrs. per week.	Lab. Hrs. per week.	Page
Structural Engineering III	1	3	71
Municipal Engineering I	1		73
Mechanical Engineering VII	1		84
Surveying IV	1	2	75
Surveying V	1½	2½	76
Economics I	1		42

FOURTH YEAR.

Industrial Chemistry II	1		50
Geology IX	1		56
General Engineering IV		2	69
General Engineering V	1		69
Railway Engineering II	1	2	72
Railway Engineering III	2		72
Municipal Engineering II, III, IV	3	3	73
Hydraulic Engineering II	2		72
Structural Engineering II	1	3	70
Structural Engineering IV	1	6	71
Mechanical Engineering IV	2		83
Economics II	1		42

NOTE—The letters (a) and (b) denote first and second terms, respectively.

F.—MECHANICAL ENGINEERING.

The profession of Mechanical Engineering embraces the design, manufacture and operation of all classes of machinery, of power plants and manufacturing plants, as well as the executive management of industries. A four years course therefore must be broad enough to give the student a thorough training in the fundamental principles, and any subdivisions intended to train a student for any one of the many specialties only, seem unwise, and are impracticable on account of the lack of time.

The first two years are devoted to the study of the fundamental subjects of Mathematics, Physics, Chemistry, and Mechanics, including experimental work in the various laboratories. Special attention is given to the subject of strength of materials, with practice in testing during the second and third years. The study of the steam engine, and other forms of heat-engines, includes courses in Thermodynamics, Valve Gears, Governors and the Balancing of Engines. Instruction is given in Mechanism, Machine Design, Shop Work, and the fundamental principles of Electrical Engineering.

Instruction in drawing extends over the four years, and gives a thorough drill in modern drafting room practice. In the more advanced courses of the fourth year the student is taught how to apply the general principles to the design and operation of special machinery, steam and gas engines, steam boilers and gas producers, and complete power plants; *i.e.*, each student is allowed to specialize as far as is practicable. The instruction in the laboratories is intended not only to familiarize the student with standard methods of testing, but also to teach him how to attack original problems.

The fourth year students are kept in touch with the local manufacturing concerns in order to familiarize them with modern power plant and shop practice.

FIRST YEAR.

Same as first year *Course A*.

SECOND YEAR.

	Lect. Hrs. per week.	Lab. Hrs. per week.	Page
Mathematics II	3		43
Mathematics III.....	3		44
Descriptive Geometry	1	2	87
Physics II	2	2	45
Physics III	1	2	45
Analytical Chemistry VII	1	2	48
General Engineering I	2		68
Surveying VI	1	3	76
Mechanical Engineering IX	1	3	84
Drawing III		6	87
Shopwork (taken during vacation)			88

THIRD YEAR.

Industrial Chemistry II	1		50
Metallurgy I	2		65
Thermodynamics I	2(a)		85
Thermodynamics II	1(b)		85
Thermodynamics V		3	86
General Engineering II	2		68
General Engineering III		2	69
Electrical Engineering I	1(a)	2(b)	78
Hydraulic Engineering I	2		71
Structural Engineering I	1		70
Mechanical Engineering I	4(a)		81
Mechanical Engineering II	4(b)		82
Mechanical Engineering III		8	83
Mechanical Engineering IV	2		83
Economics I	2		42
Shopwork (taken during vacation)			88

FOURTH YEAR.

	Lect. Hrs. per week.	Lab. Hrs. per week.	Page
Thermodynamics III	2	4(a).....	85
Thermodynamics IV		6	86
Electrical Engineering VII		2	79
Mechanical Engineering V	2	16.....	83
Mechanical Engineering VI	2	.....	83
Mechanical Engineering VIII		4	84
Economics II	1	.....	42
Mechanical Engineering X	1	.....	84

G.—ELECTRICAL ENGINEERING.

The instruction in the first two years of the course in Electrical Engineering provides for a thorough training of the student in the fundamental subjects of Mathematics, Physics, Chemistry and Mechanics, including suitable work in the various laboratories. Part of the time is devoted to elementary drawing and shop work. In the third year the work consists of an introduction to the general principles underlying all electrical work together with elementary laboratory work. Considerable time is devoted to the study of Thermodynamics and advanced mechanical drawing. The fourth year is devoted to the study of the action and design of all kinds of electrical apparatus, the design and operation of central stations, electric lighting, electric railways and power transmission.

An important part of the work consists in the working out of problems such as are frequently met in practical work. In this way the student is trained in the application of theory to the solution of practical problems.

Arrangements are made for occasional visits to electrical works.

The whole course is designed to give the student a thorough understanding of the general principles which constitute the basis of all electrical work, together with a knowledge of how these principles are applied in practice. No effort is made to give that intimate knowledge of practical details which experience alone can supply.

FIRST YEAR.

Same as first year *Course A*.

SECOND YEAR.

Same as second year *Course F*.

THIRD YEAR.

	Lect. Hrs. per week.	Lab. Hrs per week.	Page
Physics IV	1	4	46
Metallurgy I	2		65
Thermodynamics I	2(a)		85
Thermodynamics II	1(b)		85
General Engineering II	2		68
General Engineering III		2	69
Mechanical Engineering I	4(a)		81
Mechanical Engineering II	4(b)		82
Electrical Engineering II	4	3	78
Electrical Engineering III	1(a)	2(b)	79
Electrical Engineering IV	5	5	79
Economics I	1		42
Shopwork (taken during vacation)			88

FOURTH YEAR.

Metallurgy III	1(b)		66
Thermodynamics III	2	4(a)	85
Electrical Engineering V	3	3	79
Electrical Engineering VI	2(a)	1(b)	79
Electrical Engineering VIII	1(b)	2(b)	80
Hydraulic Engineering I	2		71
Mechanical Engineering IV	2		83
Mechanical Engineering VIII		3	84
Economics II	1		42

In addition to the above one of the following subjects must be selected:

Electrical Engineering IX	2(a)	1(b)	3	80
Electrical Engineering X	1(a)	2(b)	3	80
Electrical Engineering XI	2(a)	1(b)	3	80

NOTE—The letters (a) and (b) denote first and second terms, respectively.

COURSE FOR B.A. LEADING TO THE DEGREES OF B.A. AND B.Sc. IN SIX YEARS.

Students taking these courses are required to have Arts Matriculation and to register the first two years in Arts alone and pay the class and registration fess in Arts, to register the second two years in both Arts and Science, to pay both registration fees and the Science class fees and to register the last two years in Science only, paying the registration and class fees. Arts classes are subject to the regulations in the Arts Calendar, and Science classes to the regulations in the Science Calendar.

The courses for B.A. and B.Sc. must be taken as laid down in the following scheme. The regulations regarding back classes on page 25 will be applied on these courses.

(The Arts Classes are italicized).

FIRST YEAR.

		Lect. Hrs. per week.	Lab. Hrs. per week.	Page
<i>Junior English</i>		4		
<i>Junior Latin</i>				
<i>Junior Greek</i>	Any two	10		
<i>Junior French</i>				
<i>Junior German</i>				
<i>Junior Spanish</i>				
<i>Junior Mathematics (Trig. only)</i>		2(a), (1(b)		
<i>Solid Geometry I</i>		2		43
<i>Drawing I</i>		1	4	86

See Arts
Calendar

SECOND YEAR.

<i>Senior English</i>		4		
<i>Senior Latin</i>	Any one	5		
<i>Senior Greek</i>				
<i>Senior French</i>				
<i>Senior German</i>				
<i>Economics</i>	Any one	3		
<i>Politics</i>				
<i>Animal Biology</i>	Any one	3		
<i>Colonial History</i>				
<i>Coord. Geometry and Trigonometry</i>		3		43
<i>Algebra and Astronomy</i>		3		43

See Arts
Calendar

THIRD YEAR.

<i>Senior Philosophy</i>	Any one	3	See Arts Calendar	
<i>Junior Philosophy</i>				
<i>Physics I</i>		4	2	44
<i>General Chemistry I</i>		2	3	47
<i>European History</i>	Any one	3	See Arts Calendar	
<i>English History</i>				
<i>Drawing II</i>		1		87
<i>Surveying I</i>			2	74
<i>Physical Training</i>			3	89

Fourth, Fifth and Sixth Years are the same as Second, Third and Fourth Years of any of the courses in the School of Mining with the exception of Drawing II, which appears in the Third Year of the course outlined above.

If a student on one of these courses wishes to specialize in one or more of the Arts subjects, he may do so in the honour classes.

Attention is called to the fact that by proper selection of classes an entire Arts course leading to the degree M.A. and a B.Sc. course in the School of Mining, can be completed in seven years.

SUBJECTS OF STUDY.

ENGLISH LANGUAGE AND LITERATURE.

PROFESSOR—James Cappon, M.A.

ASSISTANT PROFESSOR—John F. Macdonald, M.A.

LECTURER—Fred. B. Millett, B.A.

JUNIOR CLASS.

1. Practical course in Rhetoric and Composition.

(a) General Theory and illustrations.

(b) Exercises on the above, with essays.

Mon. and Thurs. at 8. Professor Macdonald.

Text-book:—Wooley, "*Handbook of Composition*" (Heath & Co.).

2. Study of Prose Authors in selected passages. Development of English prose as illustrated by Bacon, Addison, Johnson, Macaulay, Ruskin, Carlyle, Huxley, Arnold and others. *Selected English Essays* (World's Classics Series).

Tues. at 8. Professor Macdonald.

3. Selections from Shakespeare, Plato, *Ecclesiastes*, *Omar Khayyam*, Huxley, Tennyson, and Tolstoi, illustrating various attitudes to life. Shakespeare,—*As You Like It*.

Palgrave's *Golden Treasury*.

Mon. at 10. Mr. Millett.

GERMAN.

PROFESSOR—J. Macgillivray, Ph.D. (Leipzig).

LECTURER—Thure Hedman, Ph.B. (Chicago).

PREPARATORY CLASS.

Students intending to take advanced work in any subject should have a fair reading knowledge of German. As many high schools, however, do not teach this language, the University offers a preparatory course.

The following text-books are used:—

W. H. van der Smitten and W. H. Fraser, *German Grammar* (The Copp Clark Company).

Friedrich Gerstäcker, *Germelshausen* (Ginn & Co.).

Theodor Storm, *Immensee* (Holt & Co.).

Richard von Volkmann-Leander, *Träumereien* (Ginn & Co.).

The class meets *Monday, Wednesday and Friday at 4 o'clock.*

SPANISH.

LECTURER—J. H. Brovedani, Docteur de l'Université de Rennes (Lettres).

1. *Voluntary Class.*

There will be conducted, for Science students only, a voluntary class in Spanish. The object of the course is to give students a practical acquaintance with the spoken language. There will be two lectures a week arranged by consultation at the beginning of the session. The complete course is designed to cover two years. The first year will be devoted almost entirely to oral work, in the second special attention will be given to the technical requirements of commerce and science, and to correspondence. No previous knowledge of the language is necessary.

2. Students who choose Spanish as a subject for the combined course leading to the degrees of B.A. and B.Sc. must take Junior Spanish as prescribed in the Calendar of the Faculty of Arts.

ECONOMICS.

PROFESSOR—O. D. SKELTON, M.A., Ph.D.

ASSOCIATE PROFESSOR—W. W. SWANSON, M.A., Ph.D.

LECTURER—H. Michell M.A,

ECONOMICS I.

ECONOMICS OF BUSINESS.

This course will include an investigation of the promotion, organization, and operation of modern business enterprises, together with a detailed study of corporate securities and the investment market. Attention will also be paid to modern methods of cost accounting, methods of efficiency, etc. A summary will be given, with practical examples, of the chief rules of Commercial Law affecting common business transactions. For third year students.

Lecture—Thurs.. 8-9. Professors Swanson and Skelton.

ECONOMICS II.

This course consists of lectures on Economics and will have special reference to Canadian conditions and to the interests of students of Practical Science. It will comprise a general outline of economic principles, stressing transportation, money and banking, the nature and organization of joint stock companies, the trust problem, taxation, trade unionism, municipal ownership, and socialism. For fourth year students.

Lecture—Mon. 4-5. Professor Swanson and Mr. Michell.

Text-book—Taussig, *Principles of Political Economy.*

MATHEMATICS.

PROFESSOR—J. Matheson, M.A.

ASSOCIATE PROFESSOR—D. Buchanan, M.A., Ph.D.

ASSISTANT PROFESSOR—D. S. Ellis, M.A., B.Sc., D.L.S., O.L.S.(on active military service).

ASSISTANT PROFESSOR—C. F. Gummer, M.A.

LECTURER—C. S. Allin, B.A.

ASSISTANT—K. P. Johnston, B.A., B.Sc.

In order that the class work may be done as effectively as possible each class is divided into two sections.

MATHEMATICS I.

This class will meet for the study of Mathematics eight hours per week, of which one hour per week is given to Astronomy. The subjects are as follows:—

(1) Algebra, including the leading parts of the subject, such as multiplication, division, expansion into series, fractions, indices and surds, proportion, graphing of functions, quadratics, permutations and combinations, binomial theorem, undetermined coefficients, summation of series, continued fractions, logarithms, exponentials.

Monday and Friday 9-10. Mr. Johnston.

(2) Solid Geometry, including the first 131 pages of Dupuis' *Solid Geometry*, and Pappus' *Theorems on Volumes and Surfaces*. Particular attention is given to practical applications of geometric principles.

Tuesday and Thursday 9-10. Mr. Allin.

(3) Coordinate Geometry of two and three dimensions with applications to the curves and surfaces commonly occurring in engineering practice. This course will also include a review of the more important parts of Elementary Trigonometry, and a brief introduction to the ideas of the calculus.

Tuesday, Thursday and Friday 11-12. Mr. Johnston.

(4) Astronomy, including the fundamental principles of the subject, such as the systems of coordinates, refraction, dip of the horizon, parallax, aberration, the shape and motions of the earth, the motions of the moon, precession and nutation, gravitation, planetary motion, time.

Wednesday 9-10. Professor Buchanan.

MATHEMATICS II.

Spherical trigonometry and its applications to geodesy and astronomy; least squares, the use of the ephemeris.

Tues. 8-9, Wed. 1-2, Fri. 8-9. Professor Buchanan.

MATHEMATICS III.

Differential and integral calculus, with applications to curves and curve tracing, measurement of the lengths of curves, the areas of surfaces, and the volumes of solids; mass centre; centre and moment of inertia, radius of gyration; mechanical quadrature; differential equations, as applied to elementary mechanics.

Mon. 10-11, Tues. 10-11. Professor Matheson.

PHYSICS.

PROFESSOR—Arthur L. Clark, Ph.D.

ASSOCIATE PROFESSOR—W. C. Baker, M.A.

ASSISTANT PROFESSOR—J. M. Adams, M.A., Ph.D.

ASSISTANT PROFESSOR—J. K. Robertson, M.A.

LECTURER—V. E. Pound, M.A., Ph.D.

The work in Physics is carried on in lecture and laboratory courses, which run parallel to each other. In the lecture room the fundamental principles are developed and applied, experimental demonstrations given and many problems solved. In all classes in Physics weekly exercises are required of students. In the laboratory a large number of experiments are performed. These are designed to train the student in manipulation of apparatus and instruments of precision, to teach him to make accurate measurements and to give practice in properly recording, interpreting and reducing experimental data. The laboratory course is a most valuable part of the work, supplementing as it does the work of the lectures and giving a better understanding of the principles of Physics. Opportunity is offered for advanced work in the various parts of the subject in the Arts Honour Courses. See Arts Calendar.

In all the courses in Physics, the work in the laboratories will be counted as a certain percentage of the whole work of the session. In estimating the standing in the laboratory work, both the quantity and quality of the work done will be considered.

PHYSICS I.

This class is required of first year students in all courses and is elementary, no previous knowledge of the subject being necessary. Students in this class have opportunity for assistance by Douglas tutors. (See page 19). The work is divided into two parts, as follows:—

"A"—MECHANICS.

In this part of the work the foundations of Mechanics are discussed with special emphasis on the establishment of the fundamental principles and relations. The aim is to reduce to exact statement that knowledge of matter and motion that is the common possession of all students. Numerous experiments are shown, not so much to supply new facts as to focus the attention on the quantitative aspect of phenomena already familiar. This is followed by the solution of many numerical problems taken from cases within the experience of the student, emphasizing the relations that have been established in the lectures. In this way the student is led to lay for himself a firm foundation for all later work in Physics, both cultural and technical and for work in Engineering where clear understanding of the principles of Mechanics is all important.

Lectures—Tues. and Thurs. 10-11. Professor W. C. Baker.

"B"—ELECTRICITY AND MAGNETISM, SOUND, LIGHT AND HEAT.

This part of the work consists of lectures on Magnetism, Electricity, Wave Motion, Sound, Light, and Heat, which are discussed both mathematically and experimentally.

Lectures—Wed. and Fri. 10-11. Professor Adams.

Laboratory—Wed. 1-3. Dr. Pound.

Text-book—Kimball, College Physics.

PHYSICS II.

This class is required of students in Courses A, D, E, F, and G.

This is a course of lectures on Elementary Applied Mechanics and is a continuation of Physics I. Math. II and III are taken at the same time as this class, consequently during the latter part of the year the Calculus is used freely. A general review of the important fundamental principles of Mechanics occupies the first few weeks. These are then applied to problems dealing with Motion in a Circle, Simple Harmonic Motion, Moments of Inertia, Rotation, Friction of Belts, Pivots and Bearings, Elasticity in Stretching, Bending, and Twisting, Energy and its Transformations, etc. Throughout the year, weekly exercises are done by the students, which are discussed in class later. The students in this class, like those in Physics I, have the benefit of tutorial assistance.

Lectures—Mon. and Wed. 8-9. Professor Clark.

The laboratory work, which runs parallel with the lectures, is a continuation of the work of the first year.

Laboratory—Courses F, G, Mon. 3-5; Course D, E, Tues. 3-5; Course A, Sat. 9-12. Professors Clark and Baker.

PHYSICS III.

This class is required of second year students in Courses B, F and G.

This course of one lecture a week throughout the year is intended for those intending specializing in Electricity, Electrical Engineering or Electro-Chemistry. It is intermediate in character between the first year course in Electricity (Physics I, B) and the distinctly technical courses of the later years given in the Engineering Departments. It is essentially a course in the solution of electrical problems, and includes a thorough discussion of Ohm's Law, Shunts, Available Voltage, Electrical Energy, Power, Kirchhoff's Laws, Laws of Electrolysis, Electromotive forces of cells, the Magnetic circuit and Electromagnetic Induction. The problems are largely taken from practice.

Lecture—Mon. 9-10. Professor Adams.

Text-books—Hadley, *Magnetism and Electricity for Students.*

Thompson, *Elementary Lessons in Electricity and Magnetism.*

The laboratory work of this class consists of a course of experiments in electrical measurements, involving such things as measurement of Resistance by Wheatstone's Bridge, determination of various electrical and magnetic constants, a study of such electrical instruments as galvanometers, ammeters and voltmeters and the simple potentiometer.

Laboratory—Tues. 3-5. Professor Adams.

PHYSICS IV.

Required of third year students in Course G.

The work of this class comprises a course of lectures on the Elementary Mathematical Theory of Electricity and Magnetism, and a course of laboratory experiments in advanced electrical measurement.

In the lectures are treated such topics as the more important laws and theories in Electrostatics, the properties and laws of the Magnetic Field, Electrodynamics and Electro-magnetic Induction. A brief treatment of Electro-magnetic Waves is given and systems of units and the modern trend of the electro-magnetic theory are discussed. Many problems are assigned for solution and discussed in class.

Lecture—Mon. 10-11. Professor Clark.

In the laboratory the students make detailed study of several groups of experiments. These comprise careful study of galvanometers using both steady and transient currents, measurements of capacities, permeability, insulation resistance, and self and mutual induction, the use of the potentiometer in measurement of electro-motive force of cells, calibration of voltmeters and ammeters, and study of electrical waves and discharge phenomena.

Laboratory—Mon. 3-5, Wed. 2-4. Professor Clark.

PHYSICAL LABORATORIES.

The Physics Department is located in the southern half of Ontario Hall, and contains a large lecture room, with a seating capacity of 125, a small lecture room with seating capacity of 60, a small

class room, two large rooms equipped as general elementary laboratories, and one room equipped as an electrical laboratory for advanced work. Besides these rooms are the offices for the staff, a large, well-lighted library and reading room, smaller rooms for special purposes, apparatus and store rooms. The equipment for lecture table and laboratory is steadily growing and comprises all of the more important pieces of apparatus for these purposes.

LIBRARY.

The library contains text-books, works of reference, and journals devoted to Physics and related subjects. These may be freely consulted by the student in the reading room between the hours of 8 a.m. and 5 p.m. Books may in general be taken from the building overnight upon reporting to a member of the staff and making a record in a book provided for that purpose. It is only by special permission, however, that any book may be kept away longer than one night at a time.

CHEMISTRY.

PROFESSOR—W. L. Goodwin, D.Sc., F.R.S.C.

ASSOCIATE PROFESSOR—W. O. Walker, M.A.

ASSISTANT PROFESSORS—John Waddell, B.A., Ph.D., D.Sc.; Leo F. Goodwin, A.C.G.I., Ph.D., F.I.C. (on active military service); J. A. McRae, M.A., F.I.C.; A. P. Lothrop, M.A., Ph.D.

LECTURERS—A. F. G. Cadenhead, B.A. (on active military service); J. O. Halverson, B.S., M.A., Ph.D.; E. T. Sterne, B.Sc.

FELLOW—C. L. Frear, B.S.

GENERAL CHEMISTRY.

I. ELEMENTARY—An introductory course in general chemistry, with experimental demonstrations.

Lectures—Mon. and Wed. 11-12. Professor Goodwin.

Laboratory—Tues. 1-4. Professor W. L. Goodwin, Mr. Cadenhead.

Text-books—Smith, *General Chemistry for Colleges*, (The Century Co.).

II. INTERMEDIATE—General Chemistry of the Metals, with particular reference to the theory of qualitative analysis.

Lecture—Thurs. 8-9. Professor McRae.

III. ADVANCED—A course of lectures on advanced general chemistry.

Lecture—Wed. 4-5. Professor Waddell.

Laboratory—Mon. 1-3.

IV. ADVANCED INORGANIC WORK.

Eight (8) hours to be arranged.. Professor Waddell.

ANALYTICAL CHEMISTRY.

I. INTRODUCTORY QUALITATIVE ANALYSIS.

Courses A, B, C, Fri. 1-4; D, Tues. 9-10, 1-3.

Professor McRae.

II. QUALITATIVE ANALYSIS OF SOLIDS, INCLUDING ALLOYS.

Courses B, C, D, Mon. 1-3. Professor McRae.

III. QUALITATIVE ANALYSIS OF MINERALS.

Courses A, B, C, D, Wed. 9-12. Professor McRae, Mr. Cadenhead, and assistants.

IV. INTRODUCTORY QUANTITATIVE ANALYSIS, Barium, Chloride, Alkalimetry and Acidimetry, Calcium Carbonate, Magnesium Sulphate, Coal, Bleaching Powder, Iron Ore, Copper Ore, Nickel Ore, Lead Ore.

Courses A, Wed. 2-4, Fri. 1-4; B, C, Tues. 1-3, Sat. 8-12; D, Thurs. 2-3, Fri. 1-4. Professor Waddell.

V. INTERMEDIATE QUANTITATIVE ANALYSIS. Feldspar, Titaniferous Iron Ore, Zinc Ore, Arsenic Ore, Chromite, Barite, an Alloy.

Courses—B, Thurs. 10-11, 1-2. Fri. 1-4; C, Mon. 9-10 and 3-4, Thurs. 1-3. D, Thurs. 9-11, Fri. 1-4. Professor Waddell.

VI. ADVANCED QUANTITATIVE ANALYSIS. Selected problems and exercises in quantitative analysis.

Courses—B, Tues. 3-5, Fri. 9-12; C, Tues. 3-5, Fri. 9-10, 11-12, 1-2; D, Wed. 1-4; alternate Fri. 8-12. Professor Waddell.

VII. SPECIAL ANALYTICAL COURSE FOR ENGINEERS (Courses E, F, G). The principles of analytical chemistry illustrated by laboratory work in qualitative and quantitative analysis.

Tues. 11-12, 1-3. Professor McRae.

VIII. QUANTITATIVE ANALYSIS OF INDUSTRIAL PRODUCTS.

Course B, Fri. 8-12. Professor Waddell.

ORGANIC CHEMISTRY.

I. INTRODUCTORY. This subject is treated in a general way in the lectures, and students are required to become familiar with laboratory methods in organic chemistry and to make a few typical compounds.

Lecture—Thurs. 11-12.

Laboratory—Courses B, Wed. 2-4; D, Tues. 10-12. Professor Walker.

Text-books—Moore, *Outlines of Organic Chemistry* (John Wiley and Sons).

Norris, *Experimental Organic Chemistry*.

II. INTERMEDIATE. The subject is treated in detail in the lectures, and the typical reactions of the different classes of organic compounds are studied in the laboratory.

Lecture—Wed. 2-3.

Laboratory—Mon. 4-5, Wed. 3-5. Professor Walker.

Text-books—Norris, *Experimental Organic Chemistry*.

Norris, *Outlines of Organic Chemistry* (McGraw-Hill Book Co.).

III. ADVANCED. The lectures deal with selected topics of an advanced character. The laboratory work includes quantitative work and preparations of a more difficult character.

Lecture—Thurs. at 9.

Laboratory—Mon. 8-9, 4-5. Professor Walker.

IV. ANALYSIS OF FOODS AND WATER.

Wed. 1-5. Professor Walker.

V. ADVANCED ORGANIC WORK.

Mon. 9-12; Tues. 8-11, 1-2; Wed. 8-10; Thurs. 9-10, 1-3.

Professor Walker.

PHYSICAL CHEMISTRY.

I. PHYSICAL CHEMISTRY. The various fields of Physical Chemistry, including a brief outline of electro-chemistry are taken up.

Lecture—Fri. 8-9.

Laboratory—Courses B, C, Mon. 11-12, 1-3; D, Mon. 2-5.

Professor McRae.

Text-books—Walker, *Introduction to Physical Chemistry* (Macmillan & Co.).

Findlay, *Practical Physical Chemistry* (Longmans, Green & Co.).

II. ELECTRO-CHEMISTRY. The theoretical and practical study of electro-chemistry, special attention being paid to problems of industrial importance.

Lecture—Wed. 10-11.

Laboratory—D, Mon. 1-4; B, Tues. 2-5. Professor McRae.

Text-books—Findlay, *Practical Physical Chemistry* (Longmans, Green & Co.).

Le Blanc, *Electro-Chemistry* (Macmillan & Co.).

Elbs-Hutton, *Electrolytic Preparations*, (Edward Arnold).

III. Practice in the use of the polariscope, spectroscope, microscope, refractometer, etc.

Mon. 9-11. Professors Walker and McRae.

INDUSTRIAL CHEMISTRY.

I. CHEMISTRY OF MANUFACTURING PROCESSES. The course deals with the manufacture of chemicals, industrial products, and the apparatus employed, special attention being given to problems of importance to Canada at the present time.

Lectures—Tues. 8-9, Fri. 1-2.

Laboratory—Sat. 8-12. Mr. Sterne.

Text-book—Thorp, *Outlines of Industrial Chemistry*, (Macmillan & Co.).

II. ENGINEERING CHEMISTRY. A course on engineering chemistry, the subjects dealt with being those of importance to Engineering students, such as the rusting of iron, hard and soft waters, paints, lubricants, explosives and cements.

Lecture—Tues. 1-2. Professor Waddell.

Text-book—Major Copper-Key, *Primer*, etc., on Explosives.

Each student, before entering any practical class, is required to deposit five dollars (\$5.00) with the Secretary. On presenting to the instructor of the class the receipt for this, and the class ticket, the student receives the key of his locker and a set of apparatus. The amount of the deposit is returned at the end of the session, breakages, etc., having been deducted.

GORDON HALL OF CHEMISTRY.

This building, which is entirely devoted to Chemistry, was completed in the autumn of 1911 and is thoroughly modern in every detail. There is on the third floor a large lecture amphitheatre with a seating capacity of 216, on the first floor a small lecture room suitable for advanced classes, and on both the first and third floors are small class rooms intended for tutorial purposes. There are two laboratories for general chemistry, one for medical chemistry and one for electrolysis on the third floor; two for quantitative analysis, one for organic chemistry, and two for food and water analysis on the second floor; three for qualitative analysis, one for industrial chemistry, one for physical chemistry, and one for gas analysis and electro-chemistry, on the first floor. In addition to these there are several small laboratories where ample accommodation is provided for research, and for spectroscopic or photographic work. Each member of the permanent staff is provided with a private office and laboratory.

The library of the department of chemistry is situated on the second floor and many of the chemical periodicals of importance both in English and German are kept on file and may be consulted. In addition the library is well provided with modern text-books and works of reference, and there are a few books of historic interest. It has been the aim of the department to build up a consulting library suitable for students undertaking research work. The library is now considered to be well equipped for this work. Students have free access to the library shelves and are allowed to take out books upon application to the attendant in charge.

In the planning of this building special attention has been given to the providing of ample facilities for research and graduate work in both pure and applied chemistry. Students who have obtained the B.Sc. degree will find here all that is necessary to enable them to carry on such advanced work as they may desire.

GEOLOGY.

PROFESSOR—M. B. BAKER, B.A., B.Sc., F.G.S.A.

ASSISTANT PROFESSOR—K. F. Mather, B.Sc., Ph.D.

In selecting the site for a School of Mining, the Government of Ontario was strongly influenced by the unique situation of Kingston. It has been stated by an eminent Canadian geologist that with the possible exception of Freiberg, in Germany, no school is so well situated for the teaching of Geology as is the Kingston School of Mining. Geology is the study that investigates the history of the Earth and its inhabitants. Within a half hour's walk of the college the old Laurentian Hills, the back-bone of Canada, are exposed, and lying about their old eroded and disintegrated flanks is the first volume of the geological record from which the Earth's history is to be read. Students are therefore conducted regularly into Nature's museum where geological processes have been at work so long that their results are unmistakably clear.

Within one hundred miles of Kingston there is a greater variety of economic minerals and ores mined than in any other similar area in Canada and possibly in the world. Through the kindness of the

managers, these properties are visited by the advanced students and are of inestimable value to them in forming an idea of economic geology and mining engineering.

The Geological and Mineralogical Museum, situated on the ground floor of the Ontario Hall, is equipped with splendid collections of minerals, ores, rocks, and fossils, classified and systematically arranged to illustrate most of the subjects treated of in lectures. This is a section of the work in which the co-operation of the mining public is invited, and all donations to this museum will be kept and credited to the donor.

The various courses in Geology, described in some detail below, are intended to equip the professional geologist, the mining engineer, the civil engineer requiring a knowledge of the relative merits of natural construction material, and the student who does not expect to use the knowledge professionally, but as one of the broadest studies he can take up from a purely educational standpoint. The classes are, therefore, open to Arts students as well as to those of the engineering professions. Graduates or others wishing to investigate a special geological problem will have all possible facilities in the way of laboratories and apparatus at their disposal.

GEOLOGY I.

ELEMENTARY GEOLOGY.

Students taking this class must have passed in Chemistry I. They are also required to take Mineralogy I or Mineralogy V.

An introductory course in general Geology is given preparatory for those students who proceed to a more advanced course in Geology or Mining, and at the same time a more or less complete, though elementary, course for those who do not pursue the subject any farther.

The following subjects will be treated of in the lectures:—The Atmosphere; the Hydrosphere; the Lithosphere; the probable nature of the Earth's interior; the general characters and classifications of rocks; volcanic action; earthquakes; upheaval and subsidance; glaciation; the Geological effects produced by heat, pressure, water; bosses; dykes; veins; stratification; dip and strike; anticline and syncline; faults; foliation; the nature and uses of fossils; stratigraphical Geology, and an outline of the history of the Earth.

The lectures are illustrated by maps, diagrams, and lantern slides. Laboratory work will consist of the examination of hand specimens of the more common rocks.

During the months of October and November excursions will be conducted each Saturday to places of geological interest in the vicinity of Kingston. Students in Geology and Mineralogy are required to take part in these excursions. The cost will not exceed \$5.00. Each student should provide himself with a suitable hammer, specimen bag, and notebook.

Lectures—Tues. 9-10, Thurs. 2-3. Professor Baker,

Textbook—Ries and Watson, *Engineering Geology*.

GEOLOGY II.

STRUCTURAL, DYNAMICAL, AND PHYSIOGRAPHICAL GEOLOGY.

Before taking this class students must have passed in Geology I.

First term: The principles of gradation, deformation, faulting, mountain formation, metamorphism and vulcanism are covered in a more general and a more advanced way than in Geology I. This part of the course is required of students taking courses A and C.

Second term: The origin of the Earth; the metamorphic cycle; types of marine and continental sedimentation; an introduction to paleontology. This course is required of the students taking course C.

Lectures—Wed. 10-11, first term; Mon. and Fri. 10-11, second term.

Professor Mather.

Textbook—Ries and Watson, *Engineering Geology*.

Books for Reference:

Chamberlin & Salisbury, *Geology*, Vol. I.

VanHise, *A Treatise on Metamorphism*.

Clark, *The Data of Geochemistry*.

Harker, *The Natural History of Igneous Rocks*.

Davis, *Physical Geography*.

National Geographic Society, *Monographs*.

Assigned Reading.

GEOLOGY III.

ELEMENTARY PETROGRAPHY.

Students must have passed in Geology I, and in Mineralogy II and III.

This course is essentially on igneous geology and petrography, and will consist of lectures on the use of the petrographical microscope and accessories in the determination of rock-forming minerals, and on the determination of some of the more common igneous rocks by both microscopic and field tests. This will be followed by lectures and discussion on the geological occurrences of igneous rocks, the processes of crystalization from magmas, the forms assumed, the textures, and the metamorphic changes that are produced in the mass itself and on its surroundings. The lectures will be illustrated by means of projections of thin sections of rocks, and will be supplemented by laboratory work on hand specimens and rock slides.

Lectures—Tues. and Thurs. 10-11. Professor Baker.

Laboratory class two hours per week, in sections, *Mon. 1-3 (1), or 3-5 (2), or Tues. 1-3 (3).* Professor Mather.

Textbooks:

Pirsson, *Rocks and Rock Minerals.*

Luquer, *Minerals in Rock Sections.*

GEOLOGY IV.

MINING GEOLOGY.

Before taking this class students must have passed in Geology I.

A course of lectures will be given on the genesis of ore deposits, their modes of occurrence, classification, and secondary enrichment. The subject of 'croppings' or gossan formation will be discussed, also the faulting and other disturbances of ore deposits, the tracing of the faulted portions, the surface and underground evidences of faulting, etc. During the term excursions will be made to various mines in the vicinity of Kingston.

Lectures—Mon. and Fri. 10-11. First term, Professor Baker.

Textbook—Spurr, *Geology Applied to Mining.*

Books for Reference:

Kemp, *Ore Deposits of the United States and Canada.*

Phillips & Louis, *A Treatise on Ore Deposits.*

Branner, *Syllabus of Economic Geology.*

Proc. A.I.M.E., *Origin of Ore Deposits.*

Rothwell, *The Mineral Industry.*

GEOLOGY V.

GEOLOGY OF CANADA.

Before taking this class, students must have passed Geology I.

In this course special attention will be given to Stratigraphical Geology, and the distribution of the various rock formations in Canada. The topography as well as the structural make-up of the Dominion is studied. The climatic and economic differences of the various portions of Canada are explained.

Lecture—Wed. 10-11. Second term, Professor Baker.

Books for Reference:

Brock & Young, *Geology and Economic Minerals of Canada.*

Dawson, *Geology of Canada.*

Chapman, *Minerals and Geology of Ontario and Quebec.*

Reports Geological Survey of Canada.

Reports of the various Provincial Bureaus of Mines.

GEOLOGY VI.

HISTORICAL GEOLOGY.

After a brief study of the various types of sedimentary formations and the principles of Paleogeography, the history of the North American continent

is taken up with supplementary references to the other continents when desirable. Emphasis is laid on Canadian occurrences. A number of the more important fossils of each period is studied, and their recognition on sight required. Brief consideration is also given to the history of the Science of Geology.

Lectures—Mon. and Thurs. 11-12. Professor Mather.

Textbook—Schuchert, *Historical Geology*.

Books for Reference:

Schuchert, *Paleogeography of North America*.

Chamberlin & Salisbury, *Geology*, Vols. 2 and 3.

Grabau, *Principles of Stratigraphy*.

Grabau and Shimer, *North American Index Fossils*.

Zittel, *Text-Book of Paleontology*.

Various Authors, *Outlines of Geologic History*.

Geikie, *Founders of Geology*.

Zittel, *History of Geology*.

GEOLOGY VII.

ADVANCED PETROGRAPHY.

A course of lectures will be given on the microscopic characters and classifications of igneous rocks, and on their general field characters, origin and classification. The lecture work will be supplemented by assigned special reading and by laboratory work with both hand specimens and microscopic slides. Special attention will also be paid to the metamorphic rocks.

Lecture—Fri. 10-11. Professor Baker.

Books for Reference:

Harker, *The Natural History of Igneous Rocks*.

Kemp, *Hand Book of Rocks*.

Iddings, *The Origin of Igneous Rocks*.

Iddings, Weed, Pirsson, Washington, *Classification of Igneous Rocks*.

Rosenbusch-Iddings, *Microscopical Physiography of Rock-forming Minerals*.

Rosenbusch, *Die Massige Gesteine, Element der Gesteinslehre*.

Laboratory class two hours per week, to be arranged to suit students' time-table. Professor Baker.

GEOLOGY VIII.

ECONOMIC GEOLOGY.

The work in this class is supplementary to that in Geology IV, and is an illustration of the principles of ore deposition studied in that class. For this purpose type deposits in the largest producing districts throughout the world are studied in some detail. It is, of course, impossible to treat of all products, but the basis of classification and the fundamental principles underlying economic deposits are studied with particular reference to iron, copper, nickel, zinc, lead, silver, gold, aluminium, peat, coal, gas, oil, salt, abrasive and

refractory materials. A few lectures on building stone as well as on clays and the manufacture of clay products will be given.

Lecture—Mon. 3-4, Tues. 11-12. Professor Baker.

Books for Reference:

Lindgren, *Mineral Deposits*.

Ries, *Economic Geology of the United States*.

Beck, Trans. by Weed, *Nature of Ore Deposits*.

Kemp, *Ore Deposits of the United States and Canada*,

Merrill, *The Non-metallic Minerals*.

Hancock, *Notes on Applied Geology*.

Mineral Statistics of the Geological Survey U.S. and Canada.

GEOLOGY IX.

This course is intended for students in Civil Engineering.

The occurrence, composition, texture, structure, and alterations of rocks will be considered, with special reference to their effects on the workability or removal of the rocks in excavation work, and in the selection of raw material in construction work. There will also be lectures on clay-products and the selection of building materials, and an outline of the manufacture of bricks, fire-proof blocks, terra-cotta, roofing-tile, sewer-pipe, and drainage-tile, will be given. Physiography and drainage will also be studied, and a brief summary of the Geology of Canada will be made.

Lecture—Thurs. 9-10. Professor Baker.

Textbook—Ries & Watson, *Engineering Geology*.

Books for Reference:

Gillette, *Rock Excavation, Methods and Cost*.

Merrill, *Stone for Building and Decoration*.

Howe, *The Geology of Building Stone*.

Searle, *The Clay-Workers' Hand-book*.

GEOLOGY X.

FIELD AND LABORATORY GEOLOGY.

The laboratory exercises in this course are designed to illustrate by means of specimens, models, photographs, maps and sections, the principal original and secondary structures of rock; the origin and mode of occurrence of rocks in the earth's crust, their cycles of alteration and change; their interpretation and representation in geological surveys.

The field work comprises observations upon the weathering of rocks; shore phenomena; glacial phenomena; igneous and sedimentary rocks; faulting; folds; joints; cleavage; schistosity. Practice in methods of surveying and geological mapping and construction of sections; measuring the thickness of strata and determining the relative ages of geological structures, and the preparation of a map to scale.

Two working hours per week will be arranged to suit the class at the beginning of the first term.

MINERALOGY.

PROFESSOR—William Nicol, M.A.

ASSISTANT—I. G. Cross, B.Sc.

The work in this department is intended for students taking the courses in (1) Mining and Metallurgical Engineering, (2) Analytical and Applied Chemistry, (3) Mineralogy and Geology, (4) Chemical Engineering, and (5) Civil Engineering.

It consists of six sections, viz.: Mineralogy I, II, III, IV, V and VI.

Students in Course A take sections I and III in the second year, section IV in the third year, and section VI in the fourth year.

Students in Course B take sections I and II in the second year, and sections IV and VI in the third year.

Students in Course C take sections I, II and III in the second year, and sections IV and VI in the third year.

Students in Course D take section I in the second year.

Students in Course E take section V in the fall term of the second year.

MINERALOGY I.

ELEMENTARY ENGINEERING.

The work in this class is intended as a preparation for those entering upon the studies of geology, petrography, mining and metallurgy. The class should be taken in the second session, after the Chemistry and Physics of the first session, as a knowledge of Chemistry and Physics is necessary for a proper comprehension of the subject. The regular work consists of (1) a course of lectures and demonstrations on crystallography at the beginning of the fall term, (2) illustrated lectures on the physical, optical and other properties of minerals, (3) the description of about sixty prominent Canadian minerals, (4) practical work in the determination of these by means of the blowpipe and field tests, (5) excursions on Saturdays of October and November for field work, or in case of unfavorable weather, practical work in the laboratories or museum. Students are urged to make use of the museum in the basement, and of the study room provided for them in the mineralogical department.

Each student is supplied for the session with a locked cabinet and collection of minerals for which he is held responsible, and for which a deposit

must be made. The practical work of the class is conducted in the mineralogical and blowpipe laboratory, where cabinets containing specimens of commonly occurring minerals are arranged for use. Students are taught to recognize minerals by simple field tests, such as form, colour, streak, hardness, specific gravity, etc. For this work students must provide themselves with pocket-lens, knife, streak-plate and magnet, and must supply their own blowpipe apparatus.

Saturday Excursions.

Lecture, Tues. 11-12. Professor Nicol.

Blowpipe Class, Fri. 10-12. Professor Nicol and assistant.

Text-books—Williams, *Crystallography* (Henry Holt & Co.).

Miller, *Minerals and How They Occur* (Copp, Clark Co.).

Brush & Penfield, *Manual of Determinative Mineralogy and Blowpipe Analysis*, 17th Ed., 1912 (Wiley & Sons).

Books for Reference—Crosby, *Tables for the Determination of Minerals*.

Eakle, *Tables*.

Moses & Parsons, *Mineralogy, Crystallography and Blowpipe Analysis*, 2nd Ed.

Endlich, *Manual of Qualitative Blowpipe Analysis*.

Landauer, *Blowpipe Analysis*.

Kolbeck, 6th Ed. of *Plattner's Probirkunst mit dem Löthrohre*.

Books from the Department Library and from the Professor's private library may be obtained from the Professor.

MINERALOGY II.

SYSTEMATIC MINERALOGY.

The work of this class is intended for those taking courses B and C, and is preparatory to the work in geology, petrography, and descriptive and determinative mineralogy, which should be taken during the session following.

The regular work consists of a course of lectures, three hours per week, dealing with the physical and other properties of minerals, illustrated by specimens from the lecture cabinet, microscopic slides, thin sections, models, charts and lantern slides. Essays on prescribed subjects are required.

Lectures—Mon. 11-12, Wed. 8-9, and one hour to be arranged with class; first term. Professor Nicol.

Text-books—Dana, *Text-book of Mineralogy*, 1914. (Wiley & Sons).

Williams, *Crystallography*. (Henry Holt & Co.).

Books for Reference—Miers, *Mineralogy*.

Tschermak, *Mineralogie*.

Brauns, *Mineralreich*.

MINERALOGY III. OPTICAL MINERALOGY.

The work of this class is intended for those students only who are taking Course A, Mining Engineering, Course B, Analytical and Applied Chemistry, and Course C, Mineralogy and Geology. It is preparatory to the classes of petrography and determinative mineralogy, which should be taken during the session following. The lectures treat of light and the optical properties of minerals. Reflection, diffusion, refraction, dispersion, polarization, absorption, color, etc., are described and illustrated by the use of the lantern and projection apparatus.

Lectures—Mon. 11-12, Fri. 9-10, second term. Professor Nicol.

Text-book—Dana, *Text-book of Mineralogy*, 1914. (Wiley & Sons).

MINERALOGY IV. DESCRIPTIVE AND DETERMINATIVE MINERALOGY.

Before taking this class students in Course A must have passed in Mineralogy I and III, and students in Course B in Mineralogy I and II, and students in Course C in Mineralogy I, II and III. It should be taken along with the classes of petrography, economic geology and metallurgy in the third year.

The work of this class consists in the exhibition and description of the mineral specimens contained in the several museum collections, special attention being given to ores, gangue-minerals, those having a commercial value and those of importance as rock-forming minerals in geology. By field tests and the use of the blowpipe, practice is obtained in the determination of minerals. Cabinets furnished with specimens of minerals from various parts of the world are supplied for students' use. The number of specimens is being constantly increased by collection, donation, exchange and purchase, the aim being to make the collection as complete as possible.

Laboratory—Courses B, C, Thurs. 4-5; A, B, C, Tues. 8-9, 1-3, Wed. 1-2.

Text-books—Dana, *Text-book of Mineralogy*, 1914. (Wiley & Sons).

Brush & Penfield, *Manual of Determinative Mineralogy and Blowpipe Analysis*, 1912. (Wiley & Sons).

MINERALOGY V. PREPARATORY MINERALOGY.

The work of this class is intended for students taking the course in Civil Engineering—Course E—and for those who attend the class of Geology I, without any previous knowledge of mineralogy.

The work consists of a course of about a dozen practical demonstrations, one hour per week during the fall term, to make students familiar with the more common rock-forming minerals and ores, so that the geology lectures may be more intelligible. The students are taught to recognize minerals by field-tests, such as form, colour, lustre, streak, hardness, specific gravity, etc.

Lecture—Wed. 11-12 (a).

The attention of students is called to the collection of minerals on exhibition in the students' study, and to the several collections in the museum in the basement. Students in this class should attend the Saturday excursions. Text-book—Miller, *Minerals and How They Occur*.

MINERALOGY VI.

ECONOMIC MINERALOGY.

A course of lectures, illustrated by specimens and lantern slides, supplemented by demonstrations in the museum showing the occurrence and uses of minerals.

The following minerals and mineral substances will be treated: Gold, Petroleum, Asphalt, Graphite, Diamond, Antimony and Ores, Arsenic, Tin, Corundum and Carborundum, Portland Cement, Limestone, Feldspar and Kaolin, Talc, Asbestos, Phosphates, Gypsum, Nitre and Borax, the rare earths, the gem minerals, ruby, quartz, etc.

Lecture—Wed. 8-9. Professor Nicol.

FIELD CLASSES IN GEOLOGY AND PROSPECTING.

The attention of students and others is called to the practical study of geology, mineralogy, and prospecting methods. Some of the chief mineral localities of the Kingston district are visited each session and abundant opportunities are offered for collecting specimens and studying the modes of occurrence of substances of economic value. These excursions are compulsory for all students in mineralogy and geology after the first year. The cost will not exceed \$5.00

PASS ANIMAL BIOLOGY.

PROFESSOR—A. P. Knight, M.A., M.D.

LECTURER—A. B. Klugh, M.A.

This course will deal with the outlines of classification. The lectures and demonstrations are suitable for the course in Mineralogy and Geology (C), and are held throughout the session.

*Lectures or demonstrations—*Hours to be arranged. A. B. Klugh, M.A.
Work in the museum at an hour to be agreed upon.

Textbook—Linville & Kelly, *A Textbook in General Zoölogy*.

BACTERIOLOGY.

PROFESSOR—W. T. Connell.

This course is for students in Course B, and it consists of two laboratory hours per week.

Laboratory—Thurs. 10-12.

MINING ENGINEERING.

PROFESSOR—J. C. Gwillim, B.Sc.

LECTURER—C. W. Drury, B.Sc., A.M. (on leave).

ACTING LECTURER—J. A. Reid, B.Sc.

Under this heading are placed the subjects, Mining I, Mining II, and Ore Dressing.

Mining I and Ore Dressing are taken by third year students in Mining and Metallurgy; Mining II by students of the fourth year.

Students in Course C (Mineralogy and Geology) take Ore Dressing in their third year; and Mining I in their fourth year.

The subjects of Mining and Metallurgy IV or (Metallurgy, Mining and Mill Designing) are taken up, practically, by all fourth year students in the Mining and Metallurgical Engineering course. A Summer Essay, compiled from field observations, is also required.

MINING I.

ORE DEPOSITS. Conditions which produce and indicate them; their nature and origin; their affinity with certain conditions and rocks, and their classification. These lectures are supplementary to the study of economic geology.

PROSPECTING. Methods used in prospecting for lode, placer and coal mines. Location, laws, and requirements, of mineral prospects and their examination.

DEVELOPMENT OF PROSPECTS. The early workings of mines, with a consideration of the many factors entering into the proving up of mineral bodies as commercial quantities.

BORING. The use of long distance drills for prospecting, and for reaching fluids. The rotary Diamond drill, and the Percussion drills; their fields of operation and relative merits.

EXCAVATION. The tools and machines used in breaking and removing rock. Also hand and power drilling to place explosives. The common mining explosives; their uses and operation.

MINING METHODS. A consideration of the main factors in developing a mine. The sinking of shafts; driving of tunnels, etc. The stoping or winning of minerals from the vein or ore body.

Lectures Tues. 9-10(b), Wed. 11-12, Fri. 8-9(a). Professor Gwillim.

ORE DRESSING.

These lectures follow quite closely the subject as taken up in Richards' Text-book of Ore Dressing. They follow the sequence of operations from the arrival of crude ore or mill-rock at the mill until it leaves as a concentrate or bullion. Miscellaneous processes such as magnetic separation, oil, flotation and air processes, and coal washing, are taken up separately.

The chief features of this subject are to teach the principles and operations of rock crushing and grinding, stamp milling with amalgamation, screening and sizing of crushed ore, classification of sands and slime by water, as a preparation for the separation of minerals by jigs, tables, and other devices of proved efficiency.

Lectures—Mon. 8-9, Thurs. 11-12. Mr. Reid.

Books of Reference:

Richards, *Text-book on Ore Dressing.*

Louis, *The Dressing of Minerals.*

MINING II.

PLACER MINING. Consideration of alluvial deposits and their origin: placer mining proper, hydraulic placer, and gold dredging.

SUPPORTS. Various forms of timbering or supporting a mine's passages, and stope excavations. The timbers used. Costs and alternative methods; causes of decay in timbers and their preservation. The use of iron and masonry.

TRANSPORTATION. The handling of material underground, by chutes, cars, and hoists; rope and locomotive haulage. Surface transportation by road, rope, and railway. Loading, unloading, and terminal arrangements.

HOISTING. Head frames, ropes, and drums; various systems which balance the load to some extent or give a steady load on the engines. Hoisting of ore. Safety appliances and signalling.

DRAINAGE. Sources of water, drainage by tunnels; hoisting of water; use of pumps, and principal types for light and heavy work. Bulkheads.

VENTILATION. Natural and artificial conditions which demand ventilation. Methods of ventilating metal and coal mines. Gases of a coal mine. Fans, and distribution of air in coal mines.

LIGHTING. Use and place of candles, lamps, and safety lamps.

ACCIDENTS. PRINCIPLES OF EMPLOYMENT.

MINE EXAMINATION AND VALUATION.

STUDENTS' PAPERS. These are hour or half hour talks upon observations from experience in the field, *Thursday 2-3.*

Lectures—Mon. 10-11, Wed. 9-10, Thurs. 2-3. Professor Gwillim.

Books of Reference:

- (1) C. LaNeve Foster, *Ore and Stone Mining*.
- (2) Ihlseng, *Mining Manual*.
- (3) *The Coal and Metal Miners' Pocket-book*.
- (4) H. W. Hughes, *Coal Mining*.
- (5) *Current Mining Journals, etc.*

MINING AND METALLURGY IV.

The first term work includes some problems, also the reduction and plotting of a mine survey.

In the second term these hours are given to furnace and metallurgical work for four weeks, after that to any subject suitable to the course, as a subject for designing, for example, the designing of a mill, smelter, surface plant of a mine, or equipment to illustrate the summer essay.

Tues. 2-4, Wed. 1-4. Professors Gwillim and S. F. Kirkpatrick.

SUMMER ESSAY.

In order to encourage close observation, and the faculty of expressing by text and illustration, the student during his summer vacations is expected to gather material for an essay of from two to three thousand words.

Such an essay neatly presented with sketches or illustrations may be included as part of the work in Mining and Metallurgy IV.

The subject title must be given in by the end of the first term of the final year, and the essay handed in before the end of the second term of the final year.

MILLING.

The machinery in the Mill is in most cases of standard sizes and the ores treated are in sufficient quantities to give results which are about the same as commercial practice would give. The uses of the Mill and Laboratories are to furnish training and illustration, to experiment with various processes, and to give help at very reasonable rates to those who are seeking some method of treatment. The ores received are sufficient in quantity and variety to illustrate most of the usual methods of treatment found in actual practice. The work is divided into three main portions.

(1) Stamp Milling, Cyanidation, Chlorination and other Metallurgical processes in the first term.

(2) Concentration processes in the second term.

(3) In the Metallurgical Laboratory small quantities of ores are treated by smelting in blast or reverberatory furnaces, and experiments are conducted on the refining of metals, such as lead and copper; on the determination of the properties of iron and steel, and in connection with pyrometry, and the operation of the electric furnace.

Fri. 8-4, Sat. 8-12.

THE MINING AND METALLURGICAL LABORATORIES.

These are equipped for the testing of ores in small lots from various mining districts.

The equipment of the mill as it stands at present consists of the following:—10 in. by 7 in. Blake jaw crusher; 16 in. crushing rolls; 5 stamp battery, 850 lbs., stamps with automatic feeder; 10 in. cone grinder; No. 0 Krupp Ball Mill; impact screen; inlet discharge classifier; vertical line classifier; U-tube classifier for slimes; perforated board classifier for slimes; cone classifier and 8-foot Callow tank; 3 compartment spitzkasten; 3 compartment Hartz jig; 2 compartment Evans high-speed jig; 1 Vezin jig; 4 ft. Frue Vanner; Wilfley table (riffle washer); 8 foot callow tank; Wetherell magnetic concentrator; Ball-Norton magnetic separator; Kingston magnetic separator, dry or wet; Behrend dry concentrator; Sturtevant exhauster and blower; Heald and Sisco centrifugal pump; Frenier and Sons' spiral sand pump; Cazin water-motor; Northey mine pump; centrifugal machine for slime treatment; Johnston filter press for slime treatment; Ingersoll-Sergeant rock drill; Mac Machine Company's balanced valve rock drill; Rand rock drill; tripods for rock drill; drifting column for rock drill; Jackson's hand power rock drill; barrel chlorination plant; cyanide plant.

NICOL HALL.

Nicol Hall, the latest addition to the buildings on the campus, is equipped for the accommodation of the Mining and Metallurgy Department.

In the rear of the basement there is a sampling room with power and hand grinding devices for preparing the necessary samples for the assay laboratories.

The greater part of the eastern half of the basement is devoted to fire assaying. These laboratories are equipped with fluxing and balance tables, gasoline crucible furnace, gasoline, gas, and oiluffle furnaces, and accessory apparatus.

A separate balance room is fitted with assay and chemical balances to be used in connection with this fire assaying and the chemical work carried out in the two front rooms. The latter laboratories will accommodate the final year students in Mining and Metallurgy, and be used in conjunction with the Milling and Metallurgical laboratory work.

A small room in front is fitted for electrolytic assaying.

The western half of the basement is devoted to Metallurgical laboratories and is equipped with electric furnaces, blast furnaces, roasting furnaces, etc., and with sufficient power for extended research work.

The Metallurgy lecture room, second research laboratory, cloak-rooms, etc., are on the first floor; and the Mining lecture room, draughting room and students' library on the second floor.

METALLURGY.

PROFESSOR—S. F. Kirkpatrick, M.Sc.

LECTURER—C. W. Drury, B.Sc., A.M. (on leave).

ACTING LECTURER—J. A. Reid, B.Sc.

METALLURGY I.

A thorough drilling in fuels, the special metallurgical uses of each kind, determination of calorific power, experimentally and by calculation from composition, calorific intensity and methods of pyrometry, charcoal manufacture, coals, coke, coking methods, producer gas and its manufacture in modern approved appliances, liquid fuels, etc. This is followed by a brief discussion of the physical properties and uses of the common metals. During the second term special attention is given to the study of the properties of iron and steel and the effect of the method of manufacture on these properties.

Lectures—Tues. 11-12, Wed. 8-9. Professor Kirkpatrick.

METALLURGY II.

Hydro-metallurgy of gold and silver.

Milling and amalgamation of gold and silver ores.

Metallurgy of copper, including treatment of native copper and sulphide ores by concentration and smelting, reverberatory and blast furnace matting, pyritic smelting, refining, and hydro-metallurgy.

Metallurgy of lead, including reverberatory and blast furnace practice, softening, desilverising, refining, etc.

Metallurgy of iron and steel, including preparation of the ore for smelting, production of pig iron in the blast furnace, conversion into wrought iron in the puddling furnace, manufacture of steel by the crucible, Bessemer and open-hearth processes.

Also the consideration of the ordinary methods of recovering zinc, nickel, cobalt, tin, mercury, arsenic, antimony, etc., from the ores.

One hour each week will be devoted to examinations and the discussion of metallurgical subjects by the students.

Lecture and recitation—Mon. 9-10, Tues. 9-10, Wed. 11-12, Thurs. 9-10

Professor Kirkpatrick.

METALLURGY III.

Electro-metallurgy; introductory course in electro-chemistry followed by the consideration of the electric smelting of aluminium, copper, magnesium iron, etc.

Lecture—Thurs. 2-3(b). Professor Kirkpatrick.

FIRE ASSAYING.

Quantitative determination of gold, silver and lead in ores and bullion by fire assay.

Laboratory—Sat. 8-12. Second term, Mr. Reid.

CHEMICAL ENGINEERING.

ASSOCIATE PROFESSOR—Leo F. Goodwin, A.C.G.I., Ph.D., F.I.C. (on active military service).

CHEMICAL ENGINEERING I.

INDUSTRIAL PROCESSES.

The chemistry of various important chemical manufactures is studied in detail, and its influence discussed on the design and construction of the manufacturing plant. The newest applications of electric power in the manufacture of caustic soda, fertilisers, and explosives are studied and discussed.

DESIGNING OF CHEMICAL PLANT.

Calculations and exercises in designing chemical apparatus and factories. Considerations underlying the choice of materials of construction. The design

a nitric acid plant. The general design of a sulphuric acid works. The design of a chemical plant based on experimental results worked out in the laboratory.

Lectures—Tues. 10-11, Wed. 9-10, Thurs. 10-11.

CHEMICAL ENGINEERING II.

LABORATORY WORK AND DRAWING.

Technical methods of analysis, including rapid methods, and those involving the use of special apparatus and conditions.

The elaboration of the best working conditions for a given chemical process in the laboratory.

The designing and drawing of parts of a chemical plant based on laboratory results.

The practical work will be divided between the laboratory and the draughting room as is found necessary.

Laboratory and draughting room—Tues. 9-10; Wed. 11-12; Thurs. 8-10, 1-3; alternate Fri. 8-12; Sat. 8-12, first term.

LABORATORY OF CHEMICAL ENGINEERING.

The laboratory is provided with large size models of a ball mill, of steam-jacketed evaporating pans, both plain and porcelain lined and fitted with stirring gear, with a steam-jacketed vacuum evaporating apparatus, with a small high pressure filter, with several types of vacuum filters, and with other technical apparatus.

There is further installed a large reaction tower of earthenware designed for experimental purposes, connected to an adjustable fan and ventilating flues, and provided with a liquor circulating system and with selected types of earthenware filling material.

A portable electro-motor is available for power purposes, as well as electric current up to 75 amperes at 17 volts, and 5 kilowatt at 110 volts.

There are also installed balances for the rapid weighing of small and large quantities, together with various types of special analytical apparatus.

The instruction in this laboratory is planned to accustom the student to handle fairly large quantities of materials and to become familiar with standard types of technical chemical apparatus, as well as to work out the experimental methods required for attacking a problem, and to translate the laboratory results obtained into practice.

GENERAL ENGINEERING.

PROFESSOR—E. A. Stone, Ma.E., M.Inst., C.E.

PROFESSOR—T. S. Scott, B.A., B.Sc.

This subject embraces the physical properties of materials used in the different branches of engineering and the principles involved in the theory of beams, columns, and structures.

GENERAL ENGINEERING I.

MATERIALS OF CONSTRUCTION.

Strength and quality of timber, stone, brick, cement, mortar, and concrete; physical properties of the metals and alloys used in engineering, and effects of impurities in them; testing for tensile, compressive and transverse strength.

GRAPHICAL STATICS.

Graphical representation of stresses; funicular and force polygons; dead and wind loads; graphical methods of determining centres of gravity, shearing forces and bending moments.

MECHANICS OF MATERIALS.

Resistance and elasticity of materials; stress and strain diagrams; bending moments and shearing forces; compound stresses; deflection of beams; columns and struts; riveted joints; centres of gravity and moments of inertia.

Lectures Mon. 11-12; Thurs. 9-10. Professor Stone.

Textbooks:

Malcolm, *Graphic Statics*.

Merriman, *Mechanics of Materials*.

Books of Reference:

Merriman, *Strength of Materials*.

Thurston, *Materials of Construction*.

Merriman and Jacoby, *Roofs and Bridges, Part II*.

Slocum & Hancock, *Strength of Materials*.

GENERAL ENGINEERING II.

GRAPHICAL STATICS.

Graphical determination of stresses in roof trusses, bridges, cranes, earthworks, retaining walls, dams, arches, arched ribs, cantilever and suspension bridges.

MECHANICS OF MATERIALS.

Analysis of restrained and continuous beams and columns; torsion of shafts; combined stresses; flexure of beams and theorem of three moments; plate and lattice girders and columns; resilience and fatigue of materials; initial and temperature stresses; earthworks, retaining walls and dams; arches and arched ribs; suspension bridges.

THEORY OF STRUCTURES.

Girders, roofs and bridges; selection of types with reference to span, loading, head-room, cost, and other considerations; relative advantages of riveted and pin connections; wind bracing and stiffening trusses; trestles and towers.

Lectures—Mon. 1-2, Wed. 10-11. Professor Stone.

Textbooks—Malcolm, *Graphic Statics*.

Merriman, *Mechanics of Materials*.

Books of Reference:

Slocum & Hancock, *Strength of Materials*.

Bovey, *Theory of Structures*.

Merriman and Jacoby, *Roofs and Bridges, Parts I, II, III*.

GENERAL ENGINEERING III.

This course consists of practical work in the drafting rooms, mechanical, electrical, and testing laboratories. Its object is to give the student a knowledge of the practical application of the fundamental principles of engineering in general.

Routine tests of cement, lime, mortar, brick, stone, timber, iron, steel, etc. Specific gravity, fineness, tensile and compressive, strength of cement, etc.

Measurement of mechanical power by means of indicators, dynamometers, etc. Simple experiments in thermodynamic laboratory.

Measurement of electrical power. Simple tests of motors and generators. General electrical measurements.

Laboratory and Draughting Room—Thurs. 1-3. Professor Scott,
Professor Guillet, Professor Henderson.

GENERAL ENGINEERING IV.

This course is for Civil Engineering students of the fourth year, and consists of independent work in the testing laboratories.

Laboratory—Wed. 3-5. Professor Scott.

GENERAL ENGINEERING V.

Lectures in this course comprise methods of tunnelling, including the care, handling, storing, qualities and use of the various explosives used in Engineering works.

Lecture—Mon. 10-11. Professor Scott.

GENERAL ENGINEERING VI.

For students in Civil Engineering, third year only.

GRAPHICAL REPRESENTATION.

Representation of engineering formulae and data. Progress and cost diagrams, interpretation of diagrams, solution of problems by means of diagrams.

GRAPHICAL STATICS.

Continuation of work in General Engineering II, with relation to roofs, bridges, arches and other structures. Practical work in draughting room.

Lecture—Wed. 11-12. Professor Stone.

Draughting Room—Tues. 1-4 (second term).

STRUCTURAL ENGINEERING.

PROFESSORS—E. A. Stone, Ma.E.; T. S. Scott, B.A., B.Sc.

Students about to take Structural work should have completed Mathematics I and II, and General Engineering I.

STRUCTURAL ENGINEERING I.

BUILDING CONSTRUCTION.

Foundations of buildings, walls, etc. Design of floors, floor beams, walls, roofing materials and other parts of buildings. Joints in wood, stone and steel.

Stone cutting and masonry. Concrete and reinforced concrete. Steel frame construction.

Students will be required to make independent designs of the various structures dealt with in the lectures.

Lecture—Tues. 8-9. Professor Stone.

Draughting Room—Fri. 1-4.

Text-book—Taylor and Thompson, *Concrete, Plain and Reinforced.*

STRUCTURAL ENGINEERING II.

FOUNDATIONS.

Foundations of bridges, buildings and other structures, open wells, coffer dams, caissons, substructure types and designs, specifications and estimates.

Lecture, Tues. 8-9. Professor Scott.

Draughting Room—Fri. 1-4.

Text-book:—Jacoby and Davis, *Foundations of Bridges and Buildings.*

Books of Reference:—Patton's *Foundations.*

Baker, *Masonry Construction.*

STRUCTURAL ENGINEERING III.

DESIGN OF STRUCTURES.

Roofs. Beam, plate girder and truss spans as designed for highways, according to standard specifications. Aesthetics of bridge designing.

Complete stress sheets, working drawings, and estimates are required.

Lecture—Mon. 8-9, Professor Stone.

Draughting Room—Mon. 2-5.

Text-books—Thayer, *Structural Design, Vol. II.*

Cambria Steel Hand-book.

Books of Reference—Merriman and Jacoby, *Roofs and Bridges, Pts. I, II, III.*

STRUCTURAL ENGINEERING IV.

DESIGN OF STRUCTURES.

Lectures comprise the design of details in bridge trusses and other structures, being a continuation of Structural Engineering III.

Projects will be given to the class in Bridge Design according to Standard Specifications, usually consisting of a wooden Howe truss, riveted truss, pin-connected truss, etc. Complete stress sheets, working drawings, estimates, etc., being required.

Lecture—Tues. 9-10. Professor Stone.

Draughting Room—Tues. 2-5, Fri. 9-12.

Text-books—Thayer, *Structural Design, Vol. II.*

Cambria Steel Hand-book.

Books of Reference—Merriman and Jacoby, *Roofs and Bridges, Pts. I-IV.*

HYDRAULIC ENGINEERING.

PROFESSOR—J. B. Harvey, M.Sc.

Comprises the study of Hydraulics, Canals, Harbors, River Improvements, Water Power, Irrigation, etc.

HYDRAULIC ENGINEERING I.

HYDRAULICS.

Application of hydrostatic pressure in the case of dams, gates and pipes. Flow of water and measurement of its volume by various orifices and weirs. Flow in open channels, streams, ditches, flumes, etc., and the use and application of these conductors of waters. Flow through tubes and pipes. Use of pipes as conductors of supply for domestic and power purposes. Dynamic and static pressure as applied to motors for power purposes. The efficiency of various water wheels, turbines, etc.

Lectures—Tues. and Thurs. 10-11. Professor Harvey.
Text-book:—Merriman, *Hydraulics*.

HYDRAULIC ENGINEERING II.

Comprises the study of hydrography; design and construction of dams and appendages; measurement, development and transmission of water-power; design of hydraulic power plants; river improvement; design and construction of canals and harbors.

Lectures—Tues. 11-12, Wed. 10-11. Professor Harvey.
Books of Reference:—Watt, *Improvement of Rivers*.
Frizell, *Water Power*.

RAILWAY ENGINEERING.

PROFESSOR—T. S. Scott, B.A., B.Sc.

RAILWAY ENGINEERING I.

The effects of location on traffic. Curves, rise and fall, minor and ruling grades, distance, etc., as affecting operation. Railway Act of Canada in relation to construction. Engineers' duties on construction, calculation of progress and final estimates.

Lectures—Thurs. 11-12, Fri. 10-11. Professor Scott.
Draughting Room—Wed. 2-4.

Text-book:—Webb, *Economics of Railroad Construction*.
Book of Reference: Wellington's *Railway Location*.

RAILWAY ENGINEERING II.

CONSTRUCTION.

Practical methods and costs of grading. Track laying, ballasting, etc. Types, designs, and methods of construction of timber trestles, box and arch culverts. Concreting and its inspection.

Lecture—Wed. 11-12. Professor Scott.
Draughting Room—Thurs. 1-3.
Books of Reference:—Gillet, *Cost Data*; Webb, *Railroad Construction*.

RAILWAY ENGINEERING III.

MAINTENANCE.

The upkeep of track, bridges and buildings, their inspection and methods of repairs and renewals. The duties and responsibilities of the persons in charge.

Lecture—Mon. 9-10. Professor Scott.
Text-book:—Tratman, *Railway Tracks and Track Work*.

YARDS AND TERMINALS.

General design of railway yards and terminals, including round houses and other essential buildings. Heating and ventilation of buildings.

Lecture—Fri. 8-9. Professor Scott.

Draughting Room—Thurs. 1-3.

Text-book:—Tratman, *Railway Tracks and Track Work.*

Book of Reference:—Orrock's *Structures and Estimates.*

Droege, *Freight Terminals and Trains.*

MUNICIPAL ENGINEERING.

PROFESSORS—E. A. Stone, Ma.E.; J. B. Harvey, M.Sc.; T. S. Scott, B.A., B.Sc.

MUNICIPAL ENGINEERING I.

Discussion of municipal problems.

MUNICIPAL ENGINEERING II.

WATER SUPPLY.

Municipal water supply. Rainfall. Source of supply. Quantity, quality and purification of water. Distribution, designing, and details of construction. Domestic systems.

Lecture—Mon. 2-3. Professor Harvey.

Text-book:—Turneure and Russell, *Public Water Supplies.*

MUNICIPAL ENGINEERING III.

THE COLLECTION AND DISPOSAL OF SEWAGE AND REFUSE.

SEWERAGE. The various systems of collection and removal of sewage. Design. Consideration of rainfall, run off, and water consumption. Proportioning of size. Grades and flow in sewers. Methods of construction and materials used. Plumbing. Maintenance of sewer systems, including ventilation, flushing, and inspection. Assessments.

Text-book:—Ogden, *Sewer Design.*

Books of Reference:—Ogden, *Sewer Construction.*

Folwell, *Sewerage.*

SEWAGE DISPOSAL. Methods employed. Design, construction, and maintenance of the various systems, including bacterial treatment. Refuse disposal. Kinds of refuse. Methods of collection and disposal and economic value of same. Incinerators.

Books of Reference:—Fuller, *Sewage Disposal.*

Kinnicutt-Winslow-Pratt, *Sewage Disposal.*

REFUSE DISPOSAL. Kinds of refuse. Methods of collection and disposal and economic value of same. Incinerators.

Lecture—Thur. 10-11. Professor Stone.

MUNICIPAL ENGINEERING IV.

ROADS, STREETS AND ELECTRIC RAILWAYS.

Country and city roads and pavements. Lay out, grades, and roadbeds. Various kinds of pavements and methods of construction. Cost and durability. Gutters, curbs, and gullies. Various kinds of walks, methods of construction, materials used. Method of dust prevention. Construction with street railway track. Methods of assessment. Conduit systems, and lighting of streets.

ELECTRIC RAILWAYS. Trackwork, including construction in paving, power supply, cars and car types, factors entering into economics of construction and operation.

Lecture—Wed. 9-10. Professor Scott.

Text-book—Blanchard and Drowne, *Highway Construction*.

Books of Reference—Byrne, *Highway Engineering*.

Baker, *Roads and Pavements*.

Municipal Engineering I, II and III includes practical work, three hours per week, Saturday, 9 to 12. Projects in water works, sewer designs and paving are set and completed during these hours. As far as possible each student will be given separate problems. A time limit is set on each problem.

SURVEYING.

PROFESSOR—J. B. HARVEY, M.Sc.

All branches of Surveying receive full consideration. During the outdoor instruction students are given every opportunity to become familiar with the instruments. Notes of all field work are plotted in the draughting-room, and the rules and regulations for field work and instrument-room must be strictly adhered to. Students must be engaged in the work of a class in the hours set apart for it, otherwise their attendance will not be counted.

SURVEYING I.

Description, use and adjustment of claims and tapes. Use and adjustment of level, compass, and transit. Elements of levelling and land surveying.

Exercises are required in this work, as the practical part of each class is taken into account for the term's work.

Lecture—Wed. 8-9. Professor Harvey.

Text-book:—Pence & Ketchum, *Surveying Manual*.

SURVEYING II.

FOR SECOND YEAR STUDENTS IN CIVIL ENGINEERING.

Adjustment and use of instruments. Mapping — Symbols and general arrangement, plotting. Railroad Surveying — Curves, curve problems in location, levelling, profiles, elements of switchwork. Topographical Surveying—with stadia, plane table, hand-level, and transit and level. Uses and adjustment of these various instruments. Reconnaissance and simple triangulation. Hydrographic Surveying—Methods; sextant; river surveying; stream flow. Land Surveying—Transit, compass and chain. Resurveys, irregular boundaries, special problems, determination of azimuth, and latitude. Laying out of building, and engineering construction. Earthwork. Discussion of errors.

Lectures—Mon. 9-10, Thurs. 8-9.

Field work—Fri. 1-4. Professor Harvey.

Text-books:—*Special Notes.*

Pence & Ketchum, *Surveying Manual.*

SURVEYING III.

This course is for second year students in Civil Engineering. It consists of three hours per week practical work in Land, Municipal, and Railway Surveying. This class, when not engaged in outdoor work, meets in the class or draughting room for consideration of problems, given from time to time. The date will be set when problems must be completed, and no problem will be accepted after the expiration of the time set for its completion. The attendance and class-work as well as the completed plans and problems will be considered in the class standing.

Field Work and Draughting—Mon. 1-4. Professor Harvey.

SURVEYING IV.

FOR CIVIL ENGINEERING STUDENTS ONLY.

Dominion Land Surveying—Comprising the methods adopted in Survey of Dominion Lands, as laid down in Manual of Survey, issued 1903, by the Dominion Government. Provincial Land Surveying.

Geodesy.—Comprising the principles and methods of procedure in extended triangulation. Determination of Latitude, Azimuth, and Time. Angular Levelling.

Mine Surveying.—Principles involved in Mine Surveys, and problems connected with underground work.

Photographic Surveying.—Principles involved. Field work. Mapping

Lecture—Fri. 11-12. Professor Harvey.

Field Work and Draughting—Mon. 10-12.

FOR CIVIL ENGINEERING STUDENTS OF THE THIRD YEAR.

Books of Reference:—Surveys Act, Ontario.

Manual of Survey for D.L.S.

Johnson & Smith, *Surveying*.

SURVEYING V.

FOR CIVIL ENGINEERING STUDENTS OF THE THIRD YEAR.

Advanced practical work in Land, Municipal, Railway and Construction Surveying will be given. Problems will be set on Transition Curves, Vertical Curves, Earthwork, Location and lay-out of buildings, culverts, Switch-work. Descriptions of Properties. Separate problems will be given as far as possible. The same regulations govern this as govern Surveying III.

Field Work and Draughting—Tues. 1-4. Professor Harvey.

SURVEYING VI.

FOR SECOND YEAR STUDENTS IN COURSES A, C, D, F, AND G.

Use and adjustment of instruments. Mapping—symbols, plotting, angles. Elements of Railway Engineering—curves, levelling, profiles, elements of switchwork. Topographic Surveying—stadia, plane table, hand-level, and level. Adjustment of the above; mapping. Hydrographing, Surveying—methods, sextant, river surveying. Earthwork, cross sections, stadia methods. Land surveying—original surveys and resurveys, irregular Boundaries—Lay-out of constructional work.

Lecture—Thurs. 11-12.

Field Work—Wed. 2-5. Professor Harvey.

Text-book:—*Special Notes*.

Pence & Ketchum, *Surveying Manual*.

SURVEYING VII.

FOR STUDENTS IN COURSES A AND C.

Dominion Land Surveying—Comprising the methods adopted in Survey of Dominion Lands, as laid down in Manual of Survey, issued 1903, by the Dominion Government. Determination of Latitude, Azimuth and Time.

Ontario Land Surveying.

Mining Engineering—Principles involved in Mine Surveys, and problems connected with underground work.

Topographic Surveying—Extension of work taken in Surveying VI.

Lecture—Fri. 11-12. Professor Harvey.

Field Work—Thurs. 1-3.

Books of Reference:—Surveys Act—Ontario.

Manual of Survey, D.L.S.

Johnson, *Surveying*.

ENGINEERING FIELD WORK.

PROFESSORS—T. S. Scott, B.A., B.Sc.; J. B. Harvey, M.Sc.

The classes in this subject are practical, and enable students to become perfectly familiar with the instruments and take charge of the different departments of Surveying work.

ENGINEERING FIELD WORK I.

Students will be present at the School of Mining at 10 a.m., on the day preceding the Spring Convocation, 1916, to commence Field Work, and must procure the prescribed field book and draughting material. The class will be under canvas for two weeks, receiving full instructions in practical work in Stadia, Hydrographical, and, Railway and other branches of Surveying II. The class is under camp organization. The tents, army sheets, camp utensils, etc., are furnished by the School. Each student must provide himself with a pair of heavy blankets or other bedding, draughting instruments, note book, detail, profile, cross section, and tracing paper. The expense of provisions, cooks, and personal transport must be borne by the students, an advance of \$20.00 being made to cover same.

Throughout the work, the class will be in the field daily, and in the evenings must complete notes and draught the day's work. All notes and draughting must be completed before leaving camp, for qualification. Students must notify the Secretary of their intention to attend this class not later than March 15th, 1916, so that all arrangements may be completed before the camp opens. Students should also provide themselves with any Engineers' Field Book, Tables of Logarithms, etc., they may be able to procure.

ENGINEERING FIELD WORK II.

This work is for Civil Engineering students only and will consist of practical work in Railway Location, Switch Problems, and work connected with Bridge and other Surveys. When weather does not permit of outdoor work, the class will be employed draughting the results of the practical work or working of problems.

Standing is based on term work.

Students must provide themselves with Searles' Field Engineering, 3.00.
Field Work and Draughting—Sat. 9-12. First term, Professor Scott.

ENGINEERING FIELD WORK III.

For Civil Engineering students only, consists of practical work in Railway, Structural and Hydraulic Engineering.

When weather does not permit of outdoor work, time allotted will be devoted to the draughting of practical work done, or solution of problems.

Standing is based on term work.

Field Work and Draughting—Tues. 1-5. Professor Scott.

ELECTRICAL ENGINEERING.

PROFESSOR—L. W. Gill, M.Sc. (on active military service).

ASSISTANT PROFESSOR—E. W. Henderson, B.Sc.

ASSISTANT—G. F. Drewry, B.Sc.

ELECTRICAL ENGINEERING I.

FUNDAMENTAL PRINCIPLES.

Electro-magnetism and electro-magnetic induction. The magnetic circuit. Induction of electric currents. Self and mutual induction. Elementary theory of alternating and direct current generators and motors. Common systems of transmission and distribution of electric current. General principles of illumination. Storage batteries.

Lectures—Mon. 9-10; first term. Mon. 9-10, Fri. 9-10; second term.
Professor Henderson.

Laboratory—See General Engineering III.

ELECTRICAL ENGINEERING II.

ELEMENTARY ELECTRICAL ENGINEERING.

Electromagnetism and electromagnetic induction. The magnetic circuit. Hysteresis and hysteresis loss. Measurement of magnetic quantities. Effect of temperature and age on the magnetic properties of metals.

The theory construction, and operation of transformers. Elementary theory of direct and alternating current generators and motors.

Lectures—Mon. 11-12, Wed. 9-10, Thurs. 9-10 and 11-12.

Professor Henderson.

Laboratory—Sat. 9-12.

ELECTRICAL ENGINEERING III.

ELECTRICAL MEASUREMENTS.

Continuous alternating, oscillating, and rectified currents. Generated and induced electromotive force. Analysis of complex alternating currents and electromotive forces. Laws governing the flow of current in circuits having resistance, inductance and capacity. Meters and the measurement of electrical quantities.

Lectures—Mon. 9-10; first term. Mon. 9-10, Fri. 9-10; second term.
Professor Gill.

Laboratory—Tues. 1-3.

ELECTRICAL ENGINEERING IV.

Advanced work in drawing, with special attention to electrical apparatus.
Draughting Room—Tues. 3-5, Fri. 1-4. Mr. Drewry.

ELECTRICAL ENGINEERING V.

ALTERNATING CURRENT SYSTEMS.

Theory of alternating current generators. Synchronous and Induction Motors. Rotary Converters. Potential Regulators. Phase changing. Multi-phase Systems. Transmission of power. Applications of alternating current in commercial work.

Lectures—Mon. 10-11, Tues. 9-10, Wed. 9-10. Professor Gill.
Laboratory—Tues. 2-5.

ELECTRICAL ENGINEERING VI.

DIRECT CURRENT SYSTEMS.

Advanced theory of direct current machines. Series, shunt, and compound generators and motors. Energy losses, and commutation. Efficiency, operation and control of direct current generators and motors. Theory and practical application of storage batteries. Application of direct current in commercial work.

Professor Henderson.

Lectures—Wed. 11-12, Fri. 10-11; first term. Wed. 11-12; second term.
Laboratory—Wed. 2-5; second term.

ELECTRICAL ENGINEERING VII.

GENERAL ELECTRICAL ENGINEERING.

A special laboratory course for students in Mechanical Engineering.
Laboratory—Mon. 10-12. Mr. Drewry.

ELECTRICAL ENGINEERING VIII.

ILLUMINATION.

Units and Standards of Illumination. Sources of Light. Distribution of Light. Photometers and Measurement of Illumination. Transmission and Distribution of Electric Power for Lighting Purposes.

Lecture—Mon. 1-2, second term. Professor Gill.

Laboratory—Mon. 2-4; second term.

ELECTRICAL ENGINEERING IX.

ELECTRIC RAILWAYS.

Advantages and Disadvantages of Electric Traction. Electric Motors available for Traction Work. Motor Cars and Electric Locomotives. Methods of Control. Comparison of Characteristics of Steam and Electric Locomotives. Power required for various classes of service. Brakes and Braking. Transmission and Distribution of Power for Traction Purposes.

Lectures—Wed. 10-11, Fri. 9-10 (a). Professor Gill.

Laboratory—Fri. 1-4; second term.

ELECTRICAL ENGINEERING X.

DESIGNING.

Design and Calculation of performance of transformers, generators, and motors.

Draughting Room—Fri. 1-4.

ELECTRICAL ENGINEERING XI.

TELEGRAPHY AND TELEPHONY.

The Morse System. Repeaters. Duplex and Multiplex Systems. Combination Systems. Automatic and Printing Telegraph. Railway Block Signal Systems. Modern Telephone Systems. Wireless Telegraphy and Telephony. Simultaneous Telegraphy and Telephony.

Lectures—Wed. 10-11, Fri. 9-10 (a). Mr. Drewry.

Laboratory—Fri. 1-4.

LABORATORIES OF ELECTRICAL ENGINEERING.

Laboratory No. 1 is equipped with standard types of direct current motors and generators, the motors being provided with a special form of automatic brake for purposes of loading. This laboratory is also equipped with a set of large rheostats which are used for absorbing the output of the various generators when loaded for experimental purposes. A wide range of ammeters, voltmeters, and wattmeters completes the equipment.

Laboratory No. 2 is equipped with one 10 H.P. polyphase induction motor, and one 5 H.P. single phase induction motor, each fitted with a brake for loading purposes; one 15 K.W. three-phase generator, direct connected to a 25 H.P. motor; five power transformers; one 25 K.W. rotary converter; one 10 K.W. rotary converter, and a full complement of rheostats, ammeters, voltmeters, wattmeters, tachometers, etc.

Laboratory No. 3 is equipped with standard electro-dynamometers and voltmeters for calibrating commercial meters; apparatus for measuring the magnetic properties of the magnetic metals. A motor-generator set supplies current at low voltage for calibrating ammeters, and a second small motor-generator set supplies potential differences up to 500 volts. Two small sets of storage cells supply steady current for low voltage work.

Laboratory No. 4 is provided with a complement of various types of electric lamps; a photometer for measuring illumination, and a Duddell oscillograph for observing potential and current wave forms. A constant current transformer supplies current for a.c. series arc lamps.

This laboratory is also equipped with a complete outfit of wireless apparatus, a central telephone exchange, together with a variety of telephone transmitters and receivers.

MECHANICAL ENGINEERING.

PROFESSOR—G. L. Guillet, M.Sc.

ASSISTANT PROFESSOR—W. A. Newman, B.Sc.

LECTURER—

MECHANICAL ENGINEERING I.

ELEMENTS OF MACHINE DESIGN.

Materials of Machine Construction. Characteristics and physical properties.

Analysis of Straining action in machines.

Bolts and Nuts. Thread systems. General proportions.

Rivets. Design of standard types of rivetted joints as applied to boilers, tanks, smoke flues, etc. Practical rules. Maintenance of joints.

Cylindrical and Spherical Shells. General theory and design of boilers, steam cylinders, hydraulic cylinders, etc.

Flat Plates. Design of cylinder, steam chest, manhole and dome covers, blank pipe flanges, etc.

Cotters and Gibs. Design of standard joints.

Shafts and Axles. Resistance to combined tension and bending. Design of axles, shafting, crankshafts, etc.

Shaft Couplings. Design of flange, Oldham and Universal couplings, cone and multiple disc friction clutches.

Shaft Hangers and Brackets. Design. Rules for installing and maintenance.

Keys. Design of Standard types.

Springs. Spiral and flat. Design. Relative merits of different steel and methods of heat treatment.

Transmission of power by flexible bodies. Design of belting, rope and telodynamic transmissions. Pulley design.

Aerial Cable Ways. Analysis of stresses in suspended cables due to weight, load carried and climatic conditions.

Several examinations are held during the term, and weekly exercises given.

Lectures—Wed. 11-12, 1-2; Fri. 10-12; first term. Professor Newman.

Text-book:—Unwin, *Elements of Machine Design*.

Required of third year students in courses D, F and G.

MECHANICAL ENGINEERING II.

ELEMENTS OF MACHINE DESIGN—(*Continued*).

Lubricants. Composition. Methods of lubrication. Cost.

Bearings. Design of cylindrical, conical, compound thrust, ball and roller bearings; flat, conical and anti-friction pivots.

Dynamics of wedges and screws. Design of screws for power transmission.

Differential Hoisting Blocks. General principles and design.

Gearing. Transmission of power by means of toothed gears. Strength of gear teeth. Various systems of teeth.

Brakes. Types of friction brakes. Power absorbed. Dynamometers.

Shrinkage and forced fits. Analysis of resultant stresses. Practical rules.

Dynamics of the reciprocating engine. Inertia curve. Tangential crank effort diagram.

Fly Wheels. Design. Practical experiments for determining bursting speeds, etc.

Governors. Various types. Theory and design.

Balancing of reciprocating engines, including locomotives.

Several examinations are held during the term, and weekly exercises given.

Lectures—Wed. 11-12, 1-2; Fri. 10-12; second term. Professor Newman.

Text-book:—Unwin, *Elements of Machine Design*.

Required of third year students in courses F and G.

MECHANICAL ENGINEERING III.

APPLICATION OF WORK TAKEN UP IN MECHANICAL ENGINEERING I AND II.

Draughting Room—D; Tues. 1-5; F, Mon. 3-5; Tues. 2-5; Sat. 9-12.

Professor Newman.

Required of third year students in courses D, F and G.

MECHANICAL ENGINEERING IV.

THE ELEMENTS OF THE POWER PLANT.

Fuels and combustion. Transfer of heat. Heating Surface. Generation of steam. Types of Boilers. Chimneys. Artificial draft. Smoke prevention. Mechanical stoking. Coal Handling. Use of superheated steam. Feedwater heaters. Condensing systems. Pumping machinery. Compressed air. Gas and oil engines. Gas producers.

For third year Mechanical Engineering students and fourth year students in all other courses.

Lectures—Mon. and Thurs. 11-12. Professor Guillet.

MECHANICAL ENGINEERING V.

ADVANCED MACHINE DESIGN.

Analysis and design of multi-cylinder gas engines, simple, compound, triple and quadruple expansion steam engines, air compressors, machine tools, etc.

The general principles are applied in the draughting room to the design of complete machines. The work is carried on as far as possible in the same manner as in the draughting room of an industrial establishment. Each student acts as chief draughtsman for a part of the term under the direction of the instructor in charge.

Lecture—Mon. 9-10 and 1-2. Professor Newman.

Draughting Room—Mon. 1-4; Tues. 1-5; Wed. 9-12 and 1-5; Thurs. 11-12 and 1-3.

Required of fourth year Mechanical Engineering students.

MECHANICAL ENGINEERING VI.

STEAM AND GAS PLANTS, AIR MACHINERY, HEATING AND VENTILATING.

Prime Movers—factors influencing efficiency, selection and cost estimates.

Boilers—selection, cost estimates, proportioning of grates, heating surface, superheating surface, etc.

Auxiliaries—selection, cost, design of pumps, condensers, etc.

Plant layout, piping systems, insulation, traps, etc., design of fans, flues, chimneys, coal and ash handling equipment.

Estimate of total plant cost, operating costs, etc.

Elements of Heating and Ventilating.

Lectures—Tuesday 10-11, Thursday 11-12. Professor Newman.

Required of fourth year Mechanical Engineering students.

MECHANICAL ENGINEERING VII.

KINEMATICS OF MACHINES.

Kinematic links and chains, constrained motion, higher and lower pairing; velocity and acceleration of points in mechanism, quadric, slider, and other crank chains, their inversions and applications to practical machines; instantaneous centres and centrodes; wheel trains; belt drives; the design of gear teeth; power transmission systems, their design and efficiency.

Required of third year students in Courses A, D and E.

Lecture—Wednesday 9-10. Professor Guillet..

MECHANICAL ENGINEERING VIII.

TECHNOLOGY OF FUELS.

Discussion of fuels, gaseous, liquid and solid, with respect to their suitability for power generation. Gas and fuel analysis for engineers. Calculation and calorimetric determination of the heating value of fuels. Gas analysis in connection with the operation of steam boilers. Gas engines and gas producers. Physical tests of lubricants. Causes and prevention of boiler scale. Treatment of feedwaters.

A series of lectures in combination with laboratory work for Electrical and Mechanical Engineering students, in fourth year.

Required of fourth year Mechanical and Electrical Engineering students.

Laboratory—F, Sat. 9-12; G, Mon. 1-4. Professor Guillet.

MECHANICAL ENGINEERING IX.

KINEMATICS OF MACHINES.

Motion, velocity and acceleration of plane mechanisms.

Types of motion and transformation from one type to another.

Classification of mechanisms.

Quadric and slider crank chains and their inversions.

Non-rigid link mechanisms.

Circular, cylindrical and plate cams.

Friction drives.

Gear Wheels. Evolution, outlines of gear teeth, proportions of teeth, spur, bevel, helical, skew, worm, pin, and elliptical gearing.

Simple, compound and epicyclic gear trains.

Ratchet mechanisms and escapements.

Analysis of complex machine mechanisms.

Elementary steam engine mechanics.

Lecture—Tues. 9-10.

Draughting Room—Wed. 9-12. Professor Newman.

Required of second year students in Courses F and G.

MECHANICAL ENGINEERING IX.

WORKS ORGANIZATION AND ACCOUNTING.

Organization of the staff; functions of the departments, purchasing methods, stock keeping, methods of remunerating labor, distribution of overhead expense and analysis of production charges, elements of factory accounting, depreciation of plant, selection of equipment and organization of staff for highest efficiency.

Lecture—Saturday 8-9. Professor Guillet.

Required of fourth year Mechanical and Electrical students.

THERMODYNAMICS.

PROFESSOR—G. L. Guillet, M.Sc.

LECTURER—

THERMODYNAMICS I.

Fundamental laws of Thermodynamics. Behaviour of gases under varying conditions. Theory of air compressors and air motors. Properties of steam and elementary theory of the steam engine. Thermal and mechanical efficiency of heat engines. Operation of simple valves and governors. Measurement of power. Elementary theory of gas engines.

Lectures—Tues. and Fri. 9-10 (a). Professor Guillet.

Required of third year students in courses A, D, E, F, G

THERMODYNAMICS II.

A continuation of Thermodynamics I.

Required of third year students in Courses D, E, F, G.

Lecture—Tues. 9-10 (b). Professor Guillet.

THERMODYNAMICS III.

Theory of refrigerating machines and systems. Entropy and entropy-temperature diagrams. Superheated steam. Performance of actual engines. Influence of size, speed, valve gear and ratio of expansion on economy. Steam jackets. Compound and triple expansion engines. Advanced theory of gas and oil engines. Action of steam upon turbine buckets. Flow of steam through nozzles, orifices, and turbine passages. Effects of friction on flow. Types of steam turbines, and their operation.

Lectures—Tues. 11-12, Thurs. 9-10.

Experiments in Thermodynamic Laboratory and local power plants.

Laboratory—Sat. 9-12 (a). Professor Guillet.

Required of fourth year students in Courses F and G.

THERMODYNAMICS IV.

Advanced Laboratory work for fourth year Mechanical Engineering students.

Laboratory—Fri. 9-12, 1-4. Professor Guillet.

THERMODYNAMICS V.

VALVES AND VALVE GEARS.

Slide, corliss, piston and poppet valves, etc. Valve diagrams. Fixed and reversible valve gears, valve governors, valve operating cams and eccentrics. Lecture work carried on in conjunction with draughting-room exercises and practical valve setting on laboratory apparatus.

Required of third year Mechanical Engineering students.

Lecture—Wed. 2-3.

Draughting Room or Laboratory—3-5. Professor Guillet.

THERMODYNAMIC LABORATORY.

The equipment of this laboratory includes an air compressor, gas engine and gas producer, gasoline engines, kerosene engine, centrifugal fans, centrifugal pumps, reciprocating pumps, steam engines, condensers, calorimeters, and dynamometers, together with all the auxiliary apparatus required for making tests and carrying on experimental work. All apparatus is of standard type and latest design.

A considerable part of the practical work in Thermodynamics is done in connection with the central heating and power plant, which affords exceptional advantages for carrying on experimental work, having been designed with due regard to this purpose.

Every year extensive tests are undertaken of commercial power plants located in Kingston and vicinity, and it is believed that this is a specially valuable feature of the course.

DRAWING.

LECTURER—A. M. Squire, B.Sc.

DRAWING I.

The lectures and practical work are arranged with the view of preparing the student for the subjects of Mechanical Drawing, Descriptive Geometry, etc., in the different branches of Engineering.

Each student at the opening of the term must provide himself with a set of drawing instruments of approved standard.

The class standing will be determined by the term's work.

The work will consist of (a) Free-hand lettering adapted to working drawings; (b) Projection Drawing, including intersections and developments; Simple working drawings.

Mon. 3-5; Fri. 1-4.

Texts:—Reinhardt, *Lettering*.

Anthony, *Mechanical Drawing*.

DRAWING II.

The work will include detailing from assembled drawings, making assembled drawings, from detail drawings and from free-hand sketches of details of machines, tracing and blue-printing.

The class standing is determined by the term's work.

Course A, Mon. 9-10, 1-3; Course D, Sat. 9-12; Course E, Wed. 2-5.

DRAWING III.

A more extended course than as outlined in Drawing II.

The class standing is determined by the term's work.

Courses F and G, Fri. 9-12, Sat. 9-12.

DESCRIPTIVE GEOMETRY.

LECTURER—A. M. Squire, B.Sc.

Division of Space into four quadrants. Orthogonal projection of a point in the four quadrants. Orthogonal projection of a line in all the quadrants. Parallel-perspective representations of points and lines in all the quadrants. True length of a line. Traces of lines and planes. Intersecting lines and planes. Representations of infinite planes. Intersection of a line and a plane; intersection of two and more planes. Perpendicular to a plane. Inclination of a plane to the horizontal and vertical planes of projection. Rotation of planes about a fixed axis. Parallel planes; distance between them. Perpendicular to a line in general. Common perpendicular to any two lines in space. Intersection of solids.

Generalization of different modes of projection by introducing central projection. Its application to perspective representation in one plane. Conception of the horizon as the locus of intersection of all parallel horizontal lines. Perspective representations of solids bounded by planes.

Central projections as applied to shadows thrown by lines, definite planes and solids. Shades and shadows of cones, pyramids, spheres, etc., on one, two or more planes, when the source of light is at an infinite distance.

Intersection of curved surfaces.

The students are drilled in the subject by numerous applications in the draughting room.

Lecture—A, C, D, E, F, G, Thurs. 1-2.

Draughting room—A, C and D, Mon. 3-5; E, Wed. 9-11; F and G,

Fri. 2-4.

Text-book—Millar, *Descriptive Geometry*.

SHOP WORK.

INSTRUCTORS—S. J. Wood, Machine Shop,
F. Bryant, Blacksmith Shop.
....., Pattern Shop.

Students in all courses except F and G will be given a course of practical work in the workshops of the School as per schedule of courses.

Students in courses F and G shall enter any commercial work approved by the School and take a special course of shop training extending over a period of thirty-six weeks (18 weeks between second and third, and 18 weeks between third and fourth college years or, in case accommodation can not be secured, they shall attend special course in the workshops of the School, extending over period of 8 weeks (4 weeks preceding their third college year and 4 weeks preceding their fourth college year).

To ensure that as many students as possible will have an opportunity to obtain their shop training in commercial works, arrangements have been made with the management of several of the large manufacturing establishments, so that the students who have completed their second year, may enter upon a suitable course of shop training and receive such remuneration as will more than cover the expenses. In this case the student must present a certificate from the manager of the works in which he has carried out his practical work, stating the character of the work done and the amount of time spent in the various departments.

A complete forge shop has been added to the equipment, so that now efficient instruction can be given in machine shop practice, as well as in blacksmithing. The forge shop is located in the basement of the workshop building, and is equipped with the latest types of down draft forges, and electric drive for the blower and exhauster.

Course A, 2nd Year, Tues. 2-5. Course E, 2nd Year, Fri. 9-12. Course D, 3rd Year, Wed. 2-5.

PHYSICAL TRAINING.

The Gymnasium is a modern stone building 60 ft. x 105 ft., including in its equipment a plunge bath, shower baths, steel lockers, drying rooms, running track, and undoubtedly the best gymnasium floor in Canada.

Physical training is taken as a class by all first year students for two hours each week. In addition, voluntary classes are given to all other students.

The course includes personal hygiene and the correction of remediable defects. Education of physical powers to the highest point of efficiency, and the cultivation of those social qualities which can be well taught through the agency of athletic activity. Medical examination. Measurements. Testing of lungs and heart. Examination of sight and hearing. Correction of round shoulders, flat feet, etc.

PHYSICAL DRILL. A progressive series of exercises with dumb bells, Indian clubs, bar bells, and chest weights, combined with marching tactics and free setting-up exercises. Apparatus work on high horse, parallel bars, tumbling, ladder and horizontal bar. Special attention given to each individual case.

Basketball, indoor baseball, boxing, wrestling, fencing, swimming, running, etc.

A wide option is allowed and credit is given for attendance at gymnasium classes or for membership on the Rugby Football, Soccer, Track team, boxing, wrestling and fencing.

Hours, First Year:

Sections A, B.—Tuesday and Thursday, 9-10.

Section C.—Monday 2-3, Wednesday 3-4.

Section D.—Wednesday 3-4, Thursday 2-3.

Sections E, F.—Monday 10-11, Wednesday 2-3.

Voluntary Classes.—Time-table will be posted at the beginning of the session.

FIRST AID LECTURES.

A course of six lectures on "First Aid to the Injured" is given to third year Science students by a member of the Medical Faculty. These lectures form a part of the regular course and will be given on the following dates:—

11 a.m., 1st Tuesday and Thursday in March.

9 a.m., 2nd Monday and Tuesday in March.

10 a.m., 2nd Wednesday and Thursday in March.

LIBRARIES.

Each department of the School of Mining has a departmental library in which the books and periodicals specially related to the subject of the department are kept, and where they can be consulted. There is thus a separate library for physics, chemistry, mining and metallurgy, geology and mineralogy, general and civil engineering, and mechanical and electrical engineering. This arrangement facilitates the consultation of books in the building in which they are most useful. In some cases where a book is much used in more than one department, duplicate copies are provided.

The books are catalogued in card catalogues and numbered in such a way as to be readily accessible. Students have the greatest freedom in the use of books and journals, which they may take home under conditions varying slightly in the different libraries, but in all cases very liberal.

Books to which students constantly refer in any one branch of their work are for the most part kept in the laboratory or room in which the work is carried on. For example, books in quantitative chemical analysis which are most frequently consulted are placed on a shelf in the quantitative laboratory.

The library of the geology department receives geological survey reports from Britain and nearly all of the British colonies, from the federal government, and the greater number of the United States, and from several other foreign countries.

Students in the School of Mining have access, not only to the departmental libraries of the School, but also to the library of Queen's University which contains upwards of 50,000 volumes. Besides the card catalogue of books there is an extensive card catalogue of important articles in the leading periodicals in the possession of the library.

The following periodicals are on file in the various libraries:

DEPARTMENT OF CHEMISTRY.

Analyst.

Annual Reports of the Chemical Society.

Berichte der deutschen chemischen Gessellschaft.

Board of Trade Labour Gazette.

Bulletin of Labour (U.S.).

Canadian Labour Gazette.

Chemical Abstracts.

Chemical News.

Chemisches Centralblatt.

Experiment Station Record.

Forestry Quarterly.

Inland Revenue Bulletin.

Journal of the American Chemical Society.

Journal of the Association of Official Agricultural Chemists.

Journal of Biological Chemistry.

Journal of the Chemical Society.

Journal of Industrial and Chemical Engineering.

Journal of Physical Chemistry.

Journal of the Society of Chemical Industry.

Jahrbuch der Elektrochemie.

Jahresbericht über die Fortschritte der Chemie.

Jahresbericht über chemischen Technologie.

Kolloid-chemische Beiheft.

Kolloid-Zeitschrift.

Liebig's Annalen.

Metallurgical and Chemical Engineering.

Nature.

Proceedings of the Chemical Society.

Pulp and Paper Magazine.

Science Progress.

Transactions of the American Institute of Chemical Engineers.

Transactions of the American Electrochemical Society.

Transactions of the Faraday Society.

Zeitschrift für analytische Chemie.

Zeitschrift für angewandte Chemie.

Zeitschrift, für physikalische Chemie.

Zeitschrift für Elektrochemie.

DEPARTMENTS OF ELECTRICAL AND MECHANICAL ENGINEERING.

American Machinist.

Automobile Engineer.

Applied Science (Toronto University).

Canadian Electrical News.

Canadian Machinery.

Canadian Patent Office Record.
Compressed Air Magazine.
Electric Journal.
Electrical Review.
Electrical World.
Electrician.
Engineering (London).
Engineering Magazine.
General Electric Review.
Horseless Age.
International Marine Engineering.
Journal of the Western Society of Engineers.
Machinery.
Mechanical Engineer.
Official Journal of Patent (Great Britain).
Proceedings of the American Gas Institute.
Proceedings of the National District Heating Association.
Railway Age Gazette.
Science Abstracts, Pt. B.
Transactions of the American Institute of Electrical Engineers.
Transactions of the American Society of Mechanical Engineers.

DEPARTMENT OF CIVIL ENGINEERING.

Canadian Engineer.
Canadian Railway and Marine World.
Cement and Engineering News.
Concrete and Constructional Engineering.
Contract-Record.
Engineering-Contracting.
Engineering News.
Engineering Record.
Journal of the Association of Engineering Societies.
Minutes of Proceedings of the Institution of Civil Engineers.
Municipal Engineering.
Proceedings of the American Society of Civil Engineers.
Proceedings of the Engineers' Society of Western Pennsylvania.
Professional Memoirs, Washington Barracks, D.C.
Railway Age Gazette.
{ Transactions of the Canadian Society of Civil Engineers.

DEPARTMENT OF MINING AND METALLURGY.

Canadian Mining Journal.
Chamber of Mines, West Australia Monthly.
Coal Age.
Engineering and Mining Journal.
Conservation.

Conservation Commission Reports.
Internationale Zeitschrift für Metallographie.
Geological Survey Reports.
Iron Age.
Journal of the Chemical and Metallurgical Society of S. Africa.
Journal of Commerce.
Journal of the Iron and Steel Institute.
Metallurgical and Chemical Engineering.
Mines Department Reports.
Mining Magazine.
Mining and Scientific Press.
Mining World.
Proceedings of the Colorado Scientific Society.
Quebec, Ontario and British Columbia Bureau of Mines Reports.
Revue de Metallurgie.
School of Mines Quarterly.
The Engineering Index.
The Mining American.
The Northern Miner.
Transactions of the Institute of Mining and Metallurgy.
Transactions of the Institution of Mining Engineers.
Transactions of the American Institute of Mining Engineers.
Transactions of the Lake Superior Mining Institute.

DEPARTMENT OF PHYSICS.

Astrophysical Journal.
Annalen der Physik.
Journal de Physique.
Philosophical Magazine.
Physical Review.
Physikalische Zeitschrift.
Proceedings of the Cambridge Philosophical Society.
Science Abstracts Pt. A.

DEPARTMENTS OF GEOLOGY AND MINERALOGY.

American Journal of Science.
Economic Geology.
Geologisches Centralblatt.
Geological Magazine.
Journal of Geology.
Journal of the Geological Society.
Proceedings of the Geological Society of America.
Tashermak's mineralogische und petrographische Mittheilungen.
Zeitschrift für praktische Geologie.
Zeitschrift für Krystallographie.

ENGINEERING SOCIETY.

The representative student organization of the Faculty of Applied Science is the Engineering Society.

This society exists for the purpose of dealing with all matters concerning its members. All students registered in the Faculty of Applied Science are members of the society.

Routine matters of business are transacted by the Executive Board of the society at monthly meetings. The Board makes a full report to the regular meetings of the society.

Regular meetings are held monthly, at which matters of interest pertaining to the society are discussed. The society has been very fortunate, in recent years, in securing successful engineers to address the students during the session. These lectures are always interesting and their importance cannot be too strongly emphasized. The first year students especially should avail themselves of every opportunity afforded them to become acquainted with the leading men in the various professions. Any student member who wishes to read a scientific paper before the society will always find the executive of the Engineering Society ready and willing to arrange a date. Prizes are offered in connection with such student papers.

It is through this student society that the conduct of the Science students is regulated. The Vigilance Committee, which acts as the "court," has one or more sittings a year, when all offenders against written or unwritten laws are dealt with. This Vigilance Committee is directly responsible to the Engineering Society, and its officers are elected yearly.

There is also "The Athletic Committee", which attends to all athletic affairs of the Science students.

The Engineering Society and the graduates and alumni issue an Annual Proceedings. This publication contains a complete list of all the graduates, list of all students registered in the School of Mining, and contains a record of all matters in connection with the Engineering Society. In connection with this department is an Information Bureau, whose object is to assist the graduates, as far as possible, in securing suitable positions. All inquiries and applications should be made to the Editor, A. M. Squire, Fleming Hall.

The Society conducts a "Technical Supplies Department," where all books prescribed, stationery, note books, drawing paper and instruments, and all other supplies, may be purchased at prices but slightly over cost. Any books not in stock may be ordered and will be secured by the department on payment of a small deposit.

The Society conducts an Annual Dinner, at which members of the Faculty and prominent engineers and business men are invited to give addresses. These "Science Dinners" have always been very successful and are of great value in bringing together the undergraduates and prominent and successful leaders of the profession. An annual dance is also conducted by the society.

The officers of the Engineering Society Executive Board for 1915-1916 are as follows:—

Hon. President, Professor W. Nicol; President, W. S. Orr; 1st Vice-President, R. H. Farnsworth; 2nd Vice-President, A. A. Paoli; Secretary, A. Jackson; Asst. Secretary, D. J. Ludgate; Treasurer, M. R. Byron; Editor-in-Chief, A. M. Squire, B.Sc.; Asst. Editor, G. F. Drewry, B.Sc.; 4th Year Representative, E. Leslie; 3rd Year Representative, J. Ferguson; 2nd Year Representatives, T. R. Patterson, G. Wrong, H. C. Wright; 1st Year Representatives, J. A. Gratton, W. Macfarlane, W. St. John.

Vigilance Committee—Sr. Judge, C. E. Joslyn; Jr. Judge, W. A. Spence; Sr. Pros. Attorney, W. B. Denyes; Jr. Pros. Attorney, I. M. Marshall; Clerk, C. S. Boyd; Sheriff, M. T. McLennan; Chief of Police, J. R. Stewart; Crier, F. A. Sproule; Constables: '16, M. D. Nicholson; '17, A. P. Blackburn; '18, W. A. Marrison; '19, I. L. Sills.

Athletic Committee—President, W. H. Slinn; Vice-President, N. M. Cooke; Sec.-Treas., W. S. Mills. Representatives: '16, W. G. Barrett; '17, A. B. Rogers; '18, M. F. Ker; '19, R. A. Phillips.

NO. 5 COMPANY CANADIAN ENGINEERS.

This military organization is composed of the Staff and Students of the School of Mining.

Under ordinary peace conditions the company parades every Thursday at 3.30 p.m. (Provision is made in the time-table for this drill). The Spring camp is held at Barriefield for 8 to 10 days after the Spring examinations. In 1913 some eighty, and in 1914 about one hundred members were in camp.

In August, 1914, the company was ordered to Valcartier, where, under the direct supervision of the camp engineer, they were employed on construction, wiring, surveying, etc. Sixty men from the company went overseas with the 1st C.E.F. The Corps was ordered back to Kingston in October and formed into a Depot Company. One hundred and seventeen went with the 2nd C.E.F. in January 1915, and since that seventy have been added to the overseas engineers and some have joined other C.E.F. units.

The Depot Company was employed at Barriefield Camp during the summer of 1915 and as division engineers during the winter of 1915-16.

Officers and Members of Corps now with C.E.F. Units.

Majors	*A. Macphail, D.S.O. *L. Malcolm *W. P. Wilgar	Lieutenants	*K. P. MacPherson *A. Phelan *H. Ryan *C. V. Lawrence *W. F. Hubbard *J. B. Hanlon *D. F. Dewar *E. H. Birkett *D. C. Spears *B. L. Irwin W. H. Slinn *S. E. Prowse *J. P. Harvey. C. V. Wilkins *F. M. Wood A. Jackson. *H. B. Free. *W. C. Buchanan (dec.) *W. S. Laing *R. C. Ralph.
Captains	*D. Ellis *L. W. Gill E. W. Henderson *A. N. Ball		
Lieutenants	E. T. Sterne *E. A. Baker *W. E. Manhard *P. Earnshaw *W. M. Goodwin *R. L. Dunsmore *R. M. Calvin *J. D. Calvin *F. G. Bird *H. Patton *R. Hagey *D. Anglin *R. M. Elmer *J. Aird	C.S.M. C.Q.M.S. Sergt.	

*Serving with C.E.F. Units.

QUEEN'S Y. M. C. A.

When a student arrives at Kingston to attend the School of Mining he should look for the Queen's Y. M. C. A. corps of guides, which meet every train, at the opening of the term. Each guide wears a streamer of the University colours and will do all in his power to find a comfortable room and a good boarding house for every student. These guides, who are students in attendance at the University, give this service without remuneration, and can be depended on to give trustworthy advice.

Under the supervision of H. Slinn, of Science '16, and Science representative on the "Y" Membership Committee, each Science man will be looked after during the year by a student of the School and given any advice he may desire.

As the freshmen are the ones to whom all societies must look to for members to continue their work, the "Y" opens a large field by first entertaining all the first-year students in the University at the Freshman's reception, in conjunction with the Queen's Y. W. C. A., where each student is given the opportunity of meeting the students of all faculties; then their work along religious, social and boys' work lines is open to any who have an interest in them.

The Y. M. C. A. reading room in the Old Arts Building is always open to men, and here W. Dobson, the Student Secretary, can be consulted on any matters concerning which information is needed.

The Y. M. C. A. have meetings in Convocation Hall at 5 p.m. Wednesdays, when subjects of interest to all faculties are taken up.

Support the "Y" as well as your own faculty societies.

GRADUATES.

In the list are included graduates in the Faculty of Practical Science (B.Sc. and M.E.) and those graduates in Arts (B.A., M.A. and D.Sc.) since 1887, who after graduation have devoted themselves to scientific pursuits.

Graduates will confer a favor by forwarding changes of address to the Secretary.

†Honour standing, granted since 1909 (see page).

Name	Date of Graduation.	Address.
Adam, L. R., B.Sc.	1913..	Quebec, Que.
Agassiz, W. G. S., B.Sc.....	1909..	173 Union St., Kingston, Ont.
Ahern, F. X., B.Sc.	1914..	159 Maple Ave., Quebec, Que.
Aird, J. K. W., B.Sc.	1914..	39 Madison, Ave., Toronto.
Akins, J. R., B.Sc.....	1907..	Dept. of Interior, Ottawa.
Alder, W. R., B.Sc.....	1907..	Prescott, Ont.
Allan, F. M., B.Sc.	1915..	Ottawa, Ont.
Anderson, A. K., B.Sc.....	1913..	Ottawa, Ont.
Anglin, D. G., B.Sc.....	1911..	56 Earl St., Kingston, Ont.
Anson-Cartwright, R. H. M., B.Sc..	1904..	34 Dundonald St., Toronto, Ont.
Armstrong, W. B., B.Sc.....	1911..	Topographical Survey, Ottawa.
Arthur, A. J., B.Sc.....	1910..	Toronto, Ont.
Asselstine, Burton, B.Sc.....	1911..	Belleville, Ont.
Asselstine, C. V., B.Sc.....	1912..	Castor, Alta.
Asselstine, R. M., B.Sc.....	1913..	Collins' Bay, Ont.
Aykroyd, M. J., B.Sc.....	1913..	335 Earl St., Kingston.
Baillie, A. A., B.Sc.....	1906	
Baker, C. W., B.Sc.....	1905..	50 Garfield Ave., S., Hamilton, Ont.
Baker, H. S., B.Sc.....	1902..	52 North Main St., Niagara Falls, Ont.
Baker, H. S., B.A., '12; B.Sc.....	1914	Napanee, Ont.
Baker, J. C. B.Sc.....	1903..	Kingston, Ont.
Baker, E. A., B.Sc.	1915	Millhaven, Ont.
Baker, M. B., B.A., B.Sc.....	1902..	Professor, Geology, School of Mining, Kingston.
Baker, Wm. C., M.A.....	1895..	Associate Professor of Physics, School of Mining, Kingston.
Ball, A. N., B.Sc.....	1914..	Grenfell, Sask.
Bartlett, J., B.Sc.....	1907..	267 University Ave., Kingston.
Bartlett, R., B.Sc.	1912..	267 University Ave., Kingston.
Bateman, A. M., B.Sc.....	1910..	309 University Ave., Kingston.
Bateman, G. C., B.Sc.....	1905..	100 Indian Road, Toronto.
Battersby, W. F., B.Sc.....	1910..	S. Porcupine, Ont.
Beer, H. L., B.Sc.....	1914..	400 Richmond St., W., Toronto.

Name	Date of Graduation.	Address.
Bell, F. A., B.Sc.	1910..81	Elm St., St. Thomas, Ont.
Bell, James M., M.A.....	1899..10	& 11 Austin Friars, London, E.
Bell, J. W., B.Sc.....	1913..	Corbin, B.C.
Bell, W. A., B.Sc.....	1911..	Newhaven, Conn.
†Benger, F., B.Sc.	1913..	Port Arthur, Ont.
Bennett, Joseph, B.Sc.	1911	
Berney, K. C., B.Sc.....	1906..	Hamilton, Ont.
Berry, H. F., B.Sc.....	1912..	Vancouver, B.C.
†Bertram, A. S., B.Sc.....	1912..	Lachine, Que.
†Bertram, H. G., B.Sc.....	1910..	Dundas, Ont.
Bews, D. W., B.Sc.....	1914..	Gananoque, Ont.
Bird, F. G., B.Sc.....	1914..	Westboro, Ont.
Birkett, E. H., B.Sc.....	1910..	Kingston, Ont.
Blenkhorn, S., B.Sc.....	1909..	Canning, N.S.
Bogart, J. L. H., B.Sc.....	1903..	Militia Department, Ottawa.
Bolton, G. E., B.Sc.....	1912..	Anaconda Mont, U.S.A.
Bolton, L. L., M.A., B.Sc.....	1906..	Ottawa, Ont.
Bolton, R. A., B.Sc.....	1914..	Strathroy, Ont.
Bonham, J. C., B.Sc.	1915..	Jerseyville, Ont.
†Borden, Perry A., B.Sc.....	1911..	Hydro-Electric Commission, Co- nental Life Bldg., Toronto.
†Bothwell, N. D., B.Sc.....	1911..	Perth, Ont.
Boughner, J. W., B.Sc.....	1914..	200 Wellington St., St. Thomas, C
Bourgoing, S. B.Sc.	1912..	Tadousac, Que.
Bowen, N. L., M.A., '07; B.Sc., '09; Ph.D.	1912..	Kingston, Ont.
†Bradley, H., B.Sc.	1911..	Ottawa, Ont.
Brebner, K. A., B.Sc.....	1914..	680 Princess St., Kingston, Ont.
Brewster, F. A., B.Sc.....	1909..	Banff, Alta.
Brewster, J. A., B.Sc.....	1911..	Edmonton, Alta.
Brock, R. W., M.A.....	1895..	Geological Survey, Ottawa.
Brown, E. W., B.Sc.	1908..	Clarisholm, Alta.
Brown, E. G., B.Sc.	1915..	Ottawa, Ont.
Browne, D. G., B.Sc.	1915..	Montclair, N.J.
Browne, P. J., B.Sc.....	1909..	(Deceased).
Brown, T. S., B.Sc.....	1904..	Hawkesbury, Ont.
†Bruce, E. L., B.A., B.Sc.....	1909..	Columbia University, New York City.
Buchanan, W. G., B.Sc.....	1914..	Deceased.
Bunker, G. N., B.Sc.....	1914..	Toronto, Ont.
†Burdekin, R. W., B.Sc.....	1913..	Gouverneur, N.Y.
Burnham, D. W., B.Sc.....	1914..	Cobourg, Ont.
Burns, S. L., B.Sc.....	1914..	304 University Ave., Kingston, C
†Burroughs, C. W., B.Sc.....	1911..	363 Barrie St., Kingston.

Name	Date of Graduation.	Address.
Burrows, A. G., M.A., B.Sc.....	1902..	Bureau of Mines, Toronto.
Burrows, M., B.Sc.....	1912..	Kingston, Ont.
Buskard, C. H., B.Sc.....	1914..	Belleville, Ont.
Butler, S. H., B.Sc.....	1910..	Regina, Sask.
Cairns, D. D., B.Sc., '05; M.E., '06 Ph.D.	1910..	Geological Survey, Ottawa.
Calhoun, D. H., B.Sc.	1915..	Ottawa, Ont.
Callander, R., B.Sc.....	1910	
Calvin, J. D., B.A., B.Sc.....	1907..	Garden Island, Ont.
Calvin, R. M., B.Sc.....	1914..	Kingston, Ont.
Cameron, G., B.Sc.....	1912..	Hamilton, Ont.
Cameron, J. G., B.Sc.....	1914..	Finch, Ont.
Campbell, A. S., B.Sc.....	1907..	Civil Engineer, Kingston, Ont.
Campbell, T. D., B.Sc.....	1909..	Perth, Ont.
Campbell, W. M., B.Sc.....	1909..	(Deceased).
Cantelo, R. C., B.Sc.....	1913..	St. Thomas, Ont.
Carmichael, A. D., B.Sc.....	1914..	Worthington, Ont.
Carmichael, J. E., '09; M.D.....	1911..	Edmonton.
Carscallen, H. A., B.Sc.....	1911..	Enterprise, Ont.
Carr-Harris, A. A., B.Sc.....	1906..	Bathurst Village, N.B.
Cartwright, C. T., B.Sc. '05; M.E..	1911..	Deceased.
Caton, W. C., B.Sc.....	1912..	Edmonton, Alta.
Caverhill, A. J., B.Sc.....	1911..	Ilderton, Ont.
Caughey, J. E., B.Sc.....	1913..	Calgary, Alta.
Cavers, T. W., B.Sc.....	1904..	Copperhill, Tenn., U.S.A.
Charters, D. E., B.Sc.	1915..	Napanee, Ont.
Chartrand, D. E., B.Sc.....	1909..	Topographical Survey, Ottawa.
†Clarke, K. S., B.Sc.....	1910..	Coniston, Ont.
Code, E. S., B.Sc.....	1907..	Seattle, Wash.
Code, L. B., B.Sc.....	1906..	Vancouver, B.C.
Collins, E. A., B.Sc.....	1905..	423 Johnson St., Kingston.
Connell, F. M., B.Sc.....	1906..	Royal Bank Bldg., Toronto.
Cook, W. E., B.Sc.....	1912..	308 Albert St., Kingston.
Cook, W. S., B.Sc.	1915..	Ottawa, Ont.
Cooper, R. H., B.Sc.....	1909..	Port Arthur, Ont.
Cordukes, J. P., B.Sc.....	1908..	Topographical Survey, Ottawa.
Corkill, E. T., B.Sc. '04, M.E....	1905..	Copper Cliff, Ont.
Craig, H. B. R., B.Sc.....	1903..	82½ London St. W., Windsor.
Craig, J. D., B.A. '97, B.Sc.....	1900..	405 Trafalgar Bldg., Ottawa, Ont.
Cram, R. M., B.Sc.....	1913..	Westboro, Ont.
Crawford, V. W., B.A. '09, B.Sc..	1910..	Kingston, Ont.
Cross, J. G., B.Sc.....	1913..	School of Mining, Kingston.
Cumming, Alfred L., B.Sc.	1905..	Edmonton, Alta.
Cummings, A., B.Sc.	1908..	Box 163, Fernie, B.C.

Name.	Date of Graduation.	Address
Currie, P. W., B.Sc.....	1900..92	Argyle St., Ottawa.
Curtin, C. J., B.A. '05, B.Sc.....	1907..	Brockville, Ont.
Daley, J. C., B.Sc.....	1909..	Chicago, Ill.
Dallyn, H. A., B.Sc.....	1914..	183 Talbot St., St. Thomas, Ont.
†Daly, F. G., B.Sc.....	1914..	Lloydminster, Sask.
Dalziel, W., B.Sc.....	1913..	Montreal, Que.
Davidson, R. E., B.Sc.....	1914..	Cobourg, Ont.
†Davis, N. B., B.Sc.....	1911..	Ottawa, Ont.
Dawson, S. G., B.Sc.....	1912..	Edmonton, Alta.
Dawson, W. L., B.Sc.....	1913..	149 Patterson Ave., Ottawa.
Dempster, H. O., B.Sc.....	1908..	Vancouver, B.C.
Dennis, E. M., B.Sc.....	1904..	64 Alymer Ave., Ottawa.
†Denovan, R. A., B.Sc.....	1914..	Dalkeith, Ont.
Dewar, D. F., B.Sc.....	1912..	Edmonton, Ont.
Dick, H. S., B.Sc.....	1913..	Kingston, Ont.
Dillabough, J. V., B.Sc.....	1905..	Office Engineer, Hudson Bay Rail way, Winnipeg, Man.
Dobbs, G. G., B.Sc. '06, M.E.....	1908..	Box 97, Bessemer, Alabama, U.S.A.
Dobson, J. V., B.Sc.....	1910..	Picton, Ont.
Donnelly, John, M.E.....	1898..	Mgr. Donnelly Wrecking Co., Kingston, Ont.
Donoghue, W. B., B.Sc.....	1910..	Burritts Rapids, Ont.
Doyle, C. J., B.Sc.....	1913..	Kingston, Ont.
†Drewry, G. F., B.Sc.....	1910..	Stirling, Ont.
Drury, C. W., B.Sc. 1909, A.M....	1910..	New York, N.Y.
Dunkley, J. B., B.Sc.....	1910..	Toronto, Ont.
Dunlap, H. J., B.Sc.....	1913..	Groves Point, N.S.
Dunsmore, R. L., B.Sc.	1915..	St. Thomas, Ont.
Dwyer, E., B.Sc.....	1902..	Hamilton, Ont.
†Dwyer, W. O., M.A. '07, B.Sc..	1909..	79 Johnston St., Kingston.
Earle, W. S., C.E.....	1910..	Picton, Ont.
Earnslaw, P., B.Sc.	1915..	Almonte, Ont.
Eaton, H. T., B.Sc.....	1913..	Carlisle, Ont.
Elliott, E. F., B.Sc.....	1913..	Box 6, Kingston, Ont.
Elliott, R. A., B.Sc.....	1912..	Woodstock, Ont.
†Ellis, D. S., M.A. '08, B.Sc....	1910..	School of Mining, Kingston.
Erskine, J. A., B.Sc.....	1913..	59 Tom St., Hamilton, Ont.
Ewart, McLaren, B.Sc.....	1910..	care Resident Engineer, C. P. R., Moose Jaw, Sask.
Fairbairn, H. P., B.Sc.....	1912..	Newburg, Ont.
Fairlie, M. F., B.Sc.....	1902..	Cobalt, Ont.
Fairlie, T. U., B.Sc.....	1905..	Kingston, Ont.
Fairlie, W. A. B.Sc.....	1913..	Cobalt, Ont.
Farrell, J. W. D., B.Sc.	1915..	Moosomin, Sask.

Name	Date of Graduation.	Address.
Ferguson, M. U., B.Sc.....	1905..	City Engineer, Guelph, Ont.
Finlay, A. B., B.Sc.....	1908..	211 Lenore St., Winnipeg, Man.
Finlayson, M. D., B.Sc.....	1903..	Sydney, C.B.
Finnie, H. V., B.Sc.....	1906..	Lachine Locks, Que.
Fitzgerald, C. C., B.Sc.....	1912..	Parry Sound, Ont.
Fleming, A. A., B.A.....	1904..	Winnipeg, Man.
Fleming, D. B., B.Sc.....	1908..	Craigluth, Ont.
Fleming, H. K., B.Sc.....	1909..	Craigleith, Ont.
Fletcher, W. J., B.Sc.....	1910..	11 Victoria Block, Windsor, Ont.
Fortescue, C. L., B.Sc.....	1898..	Pittsburg, Pa.
Fournier, J. A., B.Sc.	1915..	Sudbury, Ont.
Fox, C. B., M.A.....	1895..	Pittsburg Reduction Co., East St. Louis, Ill.
Fraser, D. J., B.A., '07; D.L.S...	1911..	International Boundary Surveys' Dept. of Interior, Ottawa.
Freeman, C. H., B.Sc.....	1913..	Ottawa, Ont.
Frost, E. S., B.Sc.....	1910..	Ragged Chutes, via Cobalt.
Gage, R. G., B.Sc.....	1905..	Moncton, N.B.
Gallagher, O. G., B.Sc.....	1910..	10 Regent St., Ottawa.
Gardiner, J. D., B.Sc.....	1913..	141 Cartier St., Ottawa.
Gates, A. B., B.Sc.....	1911..	Peterborough, Ont.
George, G. A., B.Sc.....	1912..	Eganville, Ont.
George, W. B., B.Sc.....	1911..	Ottawa, Ont.
Germain, H. A., B.Sc.....	1907..	Gen. Electric Co., Pittsfield, Mass.
Gerow, S., B.Sc.....	1914..	Rossmore, Ont.
Gibson, J. N., B.Sc.....	1913..	Halifax, N.S.
Gillette, O., B.Sc.....	1910..	Dome Mines, South Porcupine, Ont.
Gleeson, J. V., B.Sc.....	1904..	Seward City, Alaska.
Gleeson, L. J. B.Sc.....	1907	
Goedike, F. B., B.Sc.....	1910	
Goodwin, E. L., B.Sc.....	1912..	(Deceased).
†Goodwin, W. M., B.A. '09, B.Sc.	1911..	Alice St., Kingston, Ont.
Gordanier, W. M., B.Sc.....	1903..	Electron, Wash.
Gow, D. B., B.Sc.....	1912..	Winnipeg, Man.
Graham, S. N., B.Sc. '00, C.E....	1903..	Halifax, N.S.
Grant, A. M., B.Sc.....	1908..	Topographical Survey, Ottawa.
Grant, J. R., B.Sc.....	1904..	601 Rogers Bldg., Vancouver, B.C.
Gray, A. W., B.Sc.....	1912..	Ottawa, Ont.
†Gray, S., B.Sc.....	1913..	Cobalt, Ont.
Greenland, C. W., B.Sc.....	1913..	Port Arthur, Ont.
Grenon, J. E., C.E.....	1906..	Box 186, Chicoutimi, Que.
Griesbach, W. C., B.Sc.....	1912..	Windsor, Ont.
Grover, G. A., B.Sc.....	1902..	85 Bay St., Toronto, Ont.

Name	Date of Graduation.	Address.
Guess, George A., M.A.....	1894..	Professor of Metallurgy, Toronto University, Toronto, Ont.
Guess, H. A., M.A.....	1895..	165 Broadway, New York City.
Haddow, A. W., B.Sc.	1909..	City Engineering Dept., Edmonton Alberta.
Hagey, C. R., B.Sc.	1915..	Brantford, Ont.
Hambly, W. R., B.Sc., '10; M.D..	1912..	Napanee, Ont.
Harding, W. D., B.Sc.....	1912..	Matheson, Ont.
Harding, W. M., B.Sc.....	1908..	Cumberland, B.C.
†Harkness, H. W., B.Sc.....	1913..	Cornwall, Ont.
Harkness, R. D., B.Sc.....	1913..	Cornwall, Ont.
Harvey, J. P., B.Sc.....	1913..	Vermillion, Alta.
Hays, C. L., B.Sc.....	1909..	Campbellford, Ont.
Hazlett, J. W., B.A., B.Sc.....	1903..	(Deceased).
Henderson, E. W., B.Sc.....	1905..	School of Mining, Kingston. Ont.
Hepinstall, R. R., B.Sc.....	1914..	Vancouver, B.C.
Herriot, G. H., B.Sc.....	1907..	Souris, Man.
Hill, Jas., M.A., '06, B.Sc.....	1908..	Ottawa, Ont.
Hinton, R., B.Sc.....	1913..	Gananoque, Ont..
Holland, A. A., B.Sc.....	1910..	Nicaragua, C.A., via New Orleans
Houston, D. W., B.Sc.....	1907..	Regina, Sask.
Howell, G. E., B.Sc.....	1912..	Hamilton, Ont.
Huber, W., B.Sc.....	1908..	Bracebridge, Ont.
Huff, F. H., B.Sc.....	1912..	Meaford, Ont.
Hughston, W. G., B.Sc.....	1911..	Ottawa, Ont.
†Hutchison, R. H., B.Sc.....	1911..	Sudbury, Ont.
Ireland, S. K., B.Sc.....	1913..	City Engineer's Dept., Toronto.
Irwin, R. T., B.Sc.....	1908..	Porcupine, Ont.
†Jackson, G. J., B.Sc.....	1909..	care Cleveland & Cameron, Vancouver, B.C.
Jackson, H. G., B.Sc.....	1903..	Bowmanville, Ont.
Jeffery, J. J., B.Sc.....	1908..	Elder's Mills. Ont.
Jeffery, R. T., B.Sc.....	1908..	Elder's Mills. Ont.
†Jemmett, D. A., M.A. '11; B.Sc.	1913..	Napanee, Ont.
†Jenkins, G. A., B.Sc.....	1909..	Portland, Oregon.
Jenkins, W. E., B.Sc.....	1907..	Box 325, Edmonton, Alta.
Johnston, K. P., B.Sc.	1915..	Lecturer at Queen's.
Johnston, P. K., B.Sc.....	1910..	22nd St. W. Fairmont Grove, Up land, California.
Johnston, W. A., M.A. '03, B.Sc...	1905..	Geological Survey, Ottawa.
Johnston, W. J., B.Sc.	1915..	Stoco. Ont.
Johnston, W. M., B.Sc.....	1913..	Toronto, Ont.
Kane, W. L., B.Sc.....	1913	
Keeley, D. E., B.Sc.....	1910..	Hosmer, B.C.

Name	Date of Graduation.	Address.
Keith, G. C., B.Sc. '07, M.Sc.....	1911	435 Grace St., Toronto.
Kelso, J. A., B.Sc. '09, M.Sc.....	1911	Exshaw, Alta.
Kemp, M. A., B.Sc.....	1912	Westboro, Ont.
†Kendall, L. E., B.Sc.....	1912	Ottawa, Ont.
Kilburn, D. G., B.Sc.....	1907	Rossland, B.C.
Kilburn, G. H., B.Sc.....	1909	Asst. Eng., Le Roi Mine, Rossland, B.C.
King, J. A. S., B.Sc.....	1909	Ottawa, Ont.
King, J. L., B.Sc.....	1907	1606 Nelson St., Vancouver, B.C.
Kinnear, L. A., B.Sc.....	1912	Port Colborne, Ont.
Kirkegaard, C. A., B.Sc.....	1913	Worthington, Ont.
†Kirkpatrick, A. M., B.Sc.....	1911	68 Johnson St., Kingston.
Kirkpatrick, Guy H., B.Sc. '97, M.E.	1898	Vancouver Club, Vancouver, B.C.
Knight, C. W., B.Sc.....	1903	Bureau of Mines, Toronto.
La Forest, M., B.Sc.....	1913	Montreal, P.Q.
Laidlaw, C. O., B.Sc.....	1913	Springfield, Ont.
Laidlaw, C. T., B.Sc.....	1913	Springfield, Ont.
Laing, W. S., B.Sc.....	1913	489 Cedar St., Peterboro, Ont.
Lamson, B. F., B.Sc.....	1912	Saranac, N.Y.
La Rush, R. J., B.Sc.....	1913	Herminie, Pa.
Lavoie, E., B.Sc.....	1907	Chicoutimi, Que.
Lawler, A. P., B.Sc.....	1911	218 Alfred St., Kingston, Ont.
†Lawson, W. E., B.Sc.....	1909	Geological Survey, Ottawa.
Lawson, W. G., B.Sc.....	1914	Dundas, Ont.
Lazier, F. S., B.Sc.....	1907	Trent Canal, Campbellford, Ont.
Lennox, J. S., B.Sc.....	1906	
†Lennox, T. C., B.Sc.....	1911	
Lewis, A. L., B.Sc.....	1912	Sewell Rancagua, Chile, S.A.
Lodge, W. L., B.Sc.....	1903	State Agric. College, Lansing, Mich.
Longmore, E. L., B.Sc.....	1912	Timmins, Ont.
Longwell, A., B.A. '00, B.Sc.....	1903	Care Canadian Mining Journal, Toronto.
Losee, W. H., B.Sc.....	1912	Toronto, Ont.
Lumb, W. E., B.Sc.....	1913	Fort Stewart, Ont.
Lynch, L., B.Sc.	1915	Chesterville, Ont.
Mabee, H. C., B.Sc.....	1898	647 Townsend Ave., Detroit, Mich.
Mackie, F. H., B.Sc.....	1903	Deceased.
McArthur, F. B.Sc.....	1907	City Engineer, Regina, Sask.
McAuliff, F. P., B.Sc.....	1913	Welland, Ont.
Macdonald, J. O., B.Sc.....	1914	Strathroy, Ont.
McIlquham, W. R., B.Sc.....	1914	Carleton Place, Ont.
Madden, M. S., B.Sc.....	1910	Napanee, Ont.

Name	Date of Graduation.	Address.
Malcolm, L., M.A. 1905, B.Sc....	1907..	Professor, School of Mining, Kingston, Ont.
Malcolm, Wyatt, M.A.....	1906	Geological Survey, Ottawa.
Malloch, E. S., B.Sc.....	1910..	Ottawa, Ont.
Malloch, G. S., B.A. '02, B.Sc....	1906	(Deceased).
Malloch, N., B.Sc.	1912	Arnprior, Ont.
Malone, E. E., B.Sc.....	1904	
Manhard, W. E., B.Sc.....	1913..	Port Arthur, Ont.
Marshall, J. H. G., B.Sc.....	1908	
Marshall, J. R., B.Sc.	1915..	Ottawa, Ont.
Martineau, J. O., B.Sc.	1915..	St. Roch, Que.
†Mateer, T. J., B.Sc.....	1910..	Deloro, Ont.
Matheson, H., B.Sc.....	1907..	Slade, Ont.
†Matheson, H. B.Sc.....	1913..	Nobel, Ont.
Matthews, H. E., B.Sc.....	1914..	Trenton, Ont.
McCann, W. S., B.Sc.....	1912..	Wellington St., Kingston, Ont.
McCannel, D. A. R., B.Sc.....	1914..	1825 Victoria Ave., Regina, Sask.
McCartney, N., B.Sc.	1915..	Kingston, Ont.
McColl, C. R., B.Sc.....	1908..	Windsor, Ont.
McCullough, F. H., B.Sc.....	1912..	Toronto, Ont.
McCulloch, R. O., B.Sc.....	1907..	Latchford, Ont.
McDiarmid, S. R., B.Sc.....	1903	
†McDougall, B. W., B.Sc.....	1913..	Lancaster, Ont.
MacDougall, F. H., B.A. '02; M.A. Ph.D.	1903..	University of Calgary, Calgary, Al.
McDowall, R. J., B.Sc.....	1912..	9 Wellington St., Kingston, Ont.
McEachern, J. J., B.Sc.....	1910..	Gravenhurst, Ont.
†Meek, R. L., B.Sc.....	1913..	Kingston, Ont.
Meikle, A. U., B.Sc.....	1912..	Ottawa, Ont.
Meikle, M., B.Sc.....	1912..	Ottawa, Ont.
†Melrose, T. M., B.Sc.....	1913..	Coaticooke, Que.
Merritt, C. P., B.Sc.....	1899..	(Deceased).
McEwen, D. F., B.Sc.....	1907..	Hensall, Ont.
McEwen, L., B.Sc.	1912	
McGinnis, T. A., B.Sc.....	1909..	Philipsburg, Que.
McGinnis, W. C., B.Sc.....	1908..	Belleville, Ont.
MacGregor, S. E., B.Sc.....	1912..	Hibbing, Minn., U.S.A.
Milden, A. J., B.Sc.....	1908..	Cornwall, Ont.
Millen, W. A., B.Sc.....	1914..	Sandwich, Ont.
Miller, T. R., B.Sc.....	1906	
Miller, W. H., B.Sc.....	1912..	Renfrew, Ont.
Milliken, J. B., B.A., B.Sc.....	1908..	Topographical Survey, Ottawa.
†Mills, T. S., B.A. '10, B.Sc.....	1911..	Ottawa, Ont.
MacIlquham, W. L., B.Sc.....	1905..	Topographical Survey, Ottawa.

Name	Date of Graduation.	Address.
McIntosh, J. S., B.Sc.....	1909	
MacKay, A. A., B.Sc.....	1910..	Helen Mine, Ont.
McKay, B. R., B.Sc.....	1908..	Geological Survey, Ottawa.
McKay, G. J., B.Sc.....	1907..	Ottawa, Ont.
McKay, R. B., B.Sc.....	1904	
MacKenzie, A. A., B.A.	1877	
Thibodaux, L., B.Sc., 1877; M.Sc.		
1888; D.Sc.	1896	
MacKenzie, C. S., B.Sc.....	1913..	Preston, Ont.
Mackenzie, G. C., B.Sc.....	1903..	Dept. of Mines, Ottawa.
MacKenzie, H. A., B.Sc.....	1907..	Joplin, Mo.
McKenzie, J. E., B.Sc.....	1912..	Calgary, Alta.
McKenzie, R. M., B.Sc.....	1912..	Eganville, Ont.
†McKeil, H. W., B.A. '08; B.Sc.	1912..	Sackville, N.B.
McLaren, A. A., B.Sc.....	1911..	Mitchell, Ont.
McLaren, G. R., B.Sc.....	1907..	Magpie, Mine, Ont.
McLennan, K. R., B.Sc.....	1904..	Montreal, Que.
McLennan, J. D., B.A., B.Sc.....	1902..	(Deceased).
†MacLeod, G. W., B.Sc.....	1913..	Sherbrooke, Que.
McNab, A. J., B.A., B.Sc.....	1902..	Trail, B.C.
McNally, H. A., B.Sc.	1915..	Westport, Ont.
MacNeill, W. K., B.A. '03, B.Sc...	1905..	5 Queen's Park, Toronto.
McNeice, L. G., B.Sc.....	1913..	Wallaceburg, Ont.
McVittie, A. E., B.Sc.....	1914..	Sudbury, Ont.
McVittie, J. S., B.Sc.....	1914..	Sudbury, Ont.
Mohan, R. T., M.Sc.	1911..	Rochester, N.Y.
Montgomery, O. M., B.Sc.....	1905..	Kensington, Pa.
Moran, P. J., B.Sc.....	1911..	Vancouver, B.C.
†Morgan, A. L., B.Sc.....	1912	
Morgan, W. B.Sc.	1915..	Rossland, B.C.
Morrison, A. G., B.Sc.....	1910..	Woodstock, Ont.
Morrison, W. M., B.Sc.....	1910..	Maxville, Ont.
Moyer, J. C., B.Sc.....	1912..	St. Catharines, Ont.
Macphail, J. G., B.A. '03, B.Sc...	1905..	Marine Dept., Ottawa.
McPherson, J. C. R., B.Sc.....	1912..	Woodstock, Ont.
Macpherson, K. P., B.Sc.....	1914..	Prescott, Ont.
McRae, A. D., B.A. '00, B.Sc.....	1902..	33 First Ave., Ottawa.
McRae, A. E. B.Sc.,	1915..	Avonmore, Ont.
Mac Rostie, N. B., B.Sc.....	1911..	Ottawa, Ont.
Mullin, T. B., B.Sc.....	1912..	Acton, Ont.
Murphy, A. A., B.Sc.....	1907..	Portland, Ont.
Murray, C. W., B.Sc.....	1907..	Mission City, B.C.
Murray, J. C., B.A., B.Sc.....	1901..	Toronto, Ont.
MacClement, W. T., M.A., D.Sc..	1903..	Prof. of Botany, Queen's University

Name	Date of Graduation.	Address.
Neilson, A. C., B.Sc.....	1909..	Stella, Ont.
Neilson, L. R., B.Sc.....	1910..	Stella, Ont.
Neish, A. C., B.A. '98, A.M. '00 Ph.D.	1904..	Instructor in Chemistry, Columbia University, New York.
Newlands, N. A., B.Sc.....	1910..	Care G. W. Jackson Engineering Co Yonkers, N.Y.
†Newman, W. A., B. Sc.....	1911..	131 Beverly St., Kingston.
Nicol, D. S., B.Sc.....	1909	
Nichols, D. A., B.Sc.....	1911..	Victoria Museum, Ottawa.
Nicol, Wm., M.A.....	1889..	Professor of Mineralogy, Kingston.
Nixon, N. J., B.Sc.	1915..	Fraser Ridge P.O., Ont.
Noble, D. S., B.Sc.....	1902 ..	(Deceased).
Noonan, W. F., B.Sc.	1915..	Elgin, Ont.
Norrish, B. E., B.Sc.....	1908..	Topographical Survey, Ottawa.
†Norrish, W. H., B.Sc.....	1912..	Guelph, Ont.
Nourse, H. C., B.Sc.....	1914..	5 Elizabeth St., Sherbrooke, Que.
Ockley, R. F., B.Sc.....	1910..	Schenectady, N.Y.
Orford, C., B.Sc.; '08; M.E.....	1909..	DeLamar, Idaho.
Orr, W. J., B.A., B.Sc.....	1909..	1207 Traders Bank Bldg., Toronto.
Orser, E. H., B.Sc.....	1910	
Osborne, J. K., B.Sc.....	1909..	Ishpheming, Mich.
Parsons, C. S., B.Sc.	1913..	Dept. of Mines, Ottawa.
Patterson, R. P., B.Sc.	1915..	Newburgh, Ont.
Patterson, G. B., B.Sc.	1915..	London, Ont.
Patton, J. H., B.Sc.	1914..	Ottawa, Ont.
Pearse, W. G., B.Sc.....	1914..	London, Ont.
Peeling, C. U., B.Sc.....	1909..	Oshawa, Ont.
Pense, E. H., B.Sc.....	1903..	Public Works Dept., Kingston.
Peppard, H. M., B.Sc.....	1907..	Box 461, Springhill, N.S.
Perry, O. M., B.Sc.....	1909..	Box 26, Windsor, Ont.
Phillips, H. L., B.Sc.....	1912..	Cornwall, Ont.
Pierce, C. B., B.Sc.....	1912..	60 Victoria St., Kingston, Ont.
Pinkerton, W. A., B.Sc.....	1906..	Richdale, Alta.
Platt, B. C., B.Sc.	1915..	Cobourg, Ont.
Pope, F. J., M.A. '91, Ph.D.....	1899..	Room 1503, 71 Broadway, New York City.
Potter, R., B.Sc.....	1907	
Pound, J. F., B.Sc.....	1913 ..	Kingston, Ont.
Pringle, J. F., B.A., '05; C.E.....	1907..	313 Tegler Bldg., Edmonton, Alta.
Prittie, L. C., B.Sc.....	1912..	Pembroke, Ont.
Prouse, S. E., B.Sc.	1915 ..	Aylmer, Ont.
Purvis, S. A., B.Sc.....	1912..	646 Seventh Ave. N. E. Edmonton Alta.

Name	Date of Graduation.	Address.
Putman, C. V., B.Sc.	1915	Ottawa, Ont.
Recknor, E., B.Sc.	1915	Princeton, Ont.
Raitt, G. H., B.Sc.	1914	Ottawa, Ont.
Ramsay, J. H., B.Sc.	1911	99 Gilmour St., Ottawa, Ont.
Ransom, F., B.Sc.	1909	Copperhill, Tenn.
Rawlins, J. W., B.A. '99, B.Sc.	1901	Copper Cliff, Ont.
Redmond, A. V., B.Sc.	1903	Care T. C. Railway, Armstrong, Via Superior Jct., Ont.
Reid, F. D., B.Sc.	1904	Care Coniagas Mines Ltd., Cobalt, Ont.
Reid, J. A., B.Sc.	1902	Nicol Hall, Queen's University.
Reid, T. J., B.Sc.	1911	Kingston, Ont.
Rice, G. T., B.Sc.	1912	Winnipeg, Man.
Richardson, G. T., B.Sc.	1906	Kingston, Ont.
Richmond, D. W., B.Sc.	1908	Kingston, Ont.
Ritchie, G., B.A., B.Sc.		Toronto, Ont.
Robbins, C. A., B.Sc.	1915	Brantford, Ont.
Robertson, J. A. T., B.Sc.	1912	Chentu, W., China.
Robertson, J. J., B.Sc.	1906	Lima, Peru, S.A.
Robinson, E. K., B.Sc.	1915	Kingston, Ont.
Robinson, S. D., B.Sc.	1911	93 Division St., Kingston, Ont.
Rockwell, D. B., B.Sc.	1908	Seattle, Wash.
Rogers, H. D., B.Sc.	1913	Gananoque, Ont.
Rogers, R. A., B.Sc.	1912	Gananoque, Ont.
Rogers, W. R., B.Sc.	1907	Bureau of Mines, Toronto.
Rooney, J. T., B.Sc.	1911	Quebec, Que.
Rose, B., B.Sc., '09; Ph.D.	1913	Ottawa, Ont.
Rose, J. H., B.Sc.	1910	Trail, B.C.
Rose, S. L. E., B.Sc.	1903	Schnectady, N.Y.
Ross, J. C., B.Sc.	1915	Grandview, Man.
Rutledge, P., B.Sc.	1914	Dunrobin, Ont.
Ryan, F. H., B.Sc.	1909	Kingston, Ont.
Saint, J. B., B.Sc.	1909	Vancouver, B.C.
Sands, J. M., B.Sc.	1907	Tampico Tamps, Mexico.
Saunders, H. C., B.Sc.	1909	Alice St., Kingston.
Sawyer, E. P., B.Sc.	1912	Westmount, Que.
Schofield, S. J., B.A. '06, M.A. '07 B.Sc. '08; Ph.D.	1912	Prof. of Geol., University of B.C. Vancouver, B.C.
Scott, A., B.A.	1899	Gadsby, Alta.
Scott, H. H., B.Sc.	1905	Perth, Ont.
Scott, H. L., B.Sc.	1914	Langham, Sask.
Scott, J. M., B.Sc.	1912	Truro, N.S.
Scott, J. N., B.Sc.	1909	Wallaceburg, Ont.

Name	Date of Graduation.	Address.
Scott, O. N., B.Sc.....	1903..	Toronto Club, Toronto.
Scott, T. S., B.A. '94; B.Sc.....	1897..	Professor at Queen's University.
†Scovil, S. S., B.Sc.....	1912..	Kenora, Ont.
Sears, J., B.Sc.....	1905..	Englehart, Ont.
Sherrill, J. R., B.Sc.....	1914..	Athol Springs, N.Y.
Shields, M. S., B.Sc.	1915..	Cleveland, Ohio.
†Shirley, E. R., B.A., B.Sc.....	1912..	St. Andrews, N.B.
Shorey, E. C., B.A. '86, M.A. '87, D.Sc.	1896 .	Bureau of Soils, U.S. Dept. of Ag Washington, D.C.
Shorey, P. M., B.Sc.....	1906..	Brantford, Ont.
Silver, L. P., B.Sc. '02; A.M.....	1905 .	420 St. Paul St., Montreal, Que.
Simmons, G. A., B.Sc. '10; M.D..	1912..	Simmons, Que.
Sine, F., M.A. '06; B.Sc.....	1908..	Sydenham, Ont.
Sirrett, E. J., B.Sc.....	1913..	Toronto, Ont.
Sirvage, E. G., B.Sc.....	1912 .	Chesterville, Ont.
Skinner, H. L., B.Sc.....	1914..	116 Gore St., Kingston, Ont.
Slipper, S. E., B.Sc.	1911..	Port Arthur, Ont.
Skinner, P. E., B.Sc.	1915..	Keene, Ont.
Sloan, D., B.Sc.....	1905..	Vancouver, B.C.
Smail, H. A., B.Sc.....	1914..	Spencerville, Ont.
Smeeton, W. F., B.Sc.....	1901..	Buffalo-Ontario Smelting Co., Ki ston, Ont.
Smith, G. J., B.Sc.	1915..	Halifax, N.S.
Smith, R. T., B.Sc.	1915..	Sudbury, Ont.
Smith, R. M., B.Sc.....	1914..	Toronto, Ont.
Smith, W. N., B.Sc.....	1914..	Box 169, Sudbury, Ont.
†Smythe, E. S., B.Sc.....	1912..	77 Duke St., Berlin, Ont.
Smyth, W. L., B.Sc.....	1906..	1731 Trafalgar Road, Vancouve B.C.
Sommerville, J. E., B.Sc.....	1912..	Seaforth, Ont.
Spearman, C., B.Sc.....	1910..	New York, N.Y.
Speirs, T. B., B.Sc.....	1909..	Appleton, Ont.
Squire, A. M., B.Sc.....	1909..	School of Mining.
Squire, R. L., B.Sc.....	1904..	Ottawa, Ont.
†Stanley, J. L., B.Sc.....	1910..	Port Colborne, Ont.
Stanley, J. N., M.A., '01, B.Sc....	1908..	Port Colborne, Ont.
Stanley, O., B.Sc.....	1910..	Copper Cliff, Ont.
Sterne, E. T., B.Sc.....	1913..	Lecturer in Chemistry, Queen's.
Stevens, F. G., B.Sc. '00, M.E....	1901..	16 Prince St., Halifax, N.S.
Stewart, J. S., B.Sc.....	1911..	Box 221, Renfrew, Ont.
Stewart, N. G., B.Sc.	1915..	Renfrew, Ont.
Stewart, W. G., B.Sc.....	1914..	Waba, Ont.
Stidwill, F., B.Sc.....	1908..	Cornwall, Ont.

Name	Date of Graduation.	Address.
Atiles, L. P., B.Sc.....	1907..	Vancouver, B.C.
Atilwell, A. J., B.Sc.....	1902..	Corry, Pa.
Atinson, J. N., B.Sc.....	1914..	Toledo, Ont.
Atirling, J. B., B.A. '09, B.Sc.....	1911 ..	Kansack, Sask.
Atott, J., B.Sc.....	1908..	716 Pender St. W., Vancouver, B.C.
Atrachan, B. O., B.Sc., M.E.....	1905..	Box 507, Ely, Minn.
Atutherland, T. F., B.Sc.....	1904..	Toronto, Ont.
Atutherland, E., B.Sc. '02, M.D....	1906..	Cardinal, Ont.
Atwezey, R. O., B.Sc.....	1908..	Kingston, Ont.
Ataylor, L. G., B.Sc.....	1914..	Quebec, Que.
Atett, B., B.Sc.....	1904..	Bratton, Sask.
Atomas, A. S., B.Sc.....	1911 ..	Topographical Survey, Ottawa.
Atompson, A. T., B.Sc.....	1904..	Prescott, Ont.
Atornton, L. A., B.A., B.Sc.....	1906..	City Commissioner, Regina, Sask.
Atimm, W. B., B.Sc.....	1906..	Dept. of Mines, Ottawa.
Atower, W. O., B.Sc.....	1912 ..	282 William St., Belleville, Ont.
Atremblay, J. A., B.Sc.....	1911..	City Hall, Quebec, Que.
Atreuman, J. D., B.A., B.Sc., M.Sc. Ph.D. . . . .	.. (Deceased).	
Atuckett, W. H., B.Sc.....	1911..	Port Arthur, Ont.
Aturner, N. L., M.A.....	1907..	Mines Branch, Ottawa, Ont.
Atwitchell, K. S., B.Sc.....	1908..	Romley, Colo.
Atjglow, W. L., M.A. '06; B.Sc. '11 M.Sc.	1912..	164 Barrie St., Kingston.
AtanPatter, H. S., B.Sc.	1915..	Aylmer, W., Ont.
Ataldner, E. F., B.Sc.....	1912..	Sacramento, California.
Atalker, H. J., B.A. '02, B.Sc....	1904..	Cornwall, Ont.
Atalker, T. L., M.A. '90, Ph.D....	..	Professor of Mineralogy, Toronto University, Toronto.
Atalton, C. G., B.Sc.	1915..	Brockville, Ont.
Atardle, J. M., B.Sc.....	1912..	Ottawa, Ont.
Atarren, H., C.E., '12; B.Sc.....	1913..	Murray Bay, Que.
Atatson, R. R., B.Sc.....	1912 ..	
Atatts, E. E., B.Sc. '12, M.Sc....	1914..	Moose Creek, Ont.
Atay, W. C., B.Sc., 1905, M.Sc.....	1906..	Lindsay, Ont.
Atebster, A. R., B.Sc.....	1904..	Cobalt, Ont.
Atells, J. Walter, B.Sc.....	1898..	192 Shuter St., Toronto.
Atwhite, H. T., B.Sc.....	1909..	Toronto, Ont.
Athyte, J. S., B.Sc.....	1914..	Box 147, St. Thomas, Ont.
Atigle, E. R., B.Sc.....	1913..	Kingsville, Ont.
Atilgar, W. P., B.Sc.....	1903..	Queen's University, Kingston, Ont.
Atilkinson, J. B., B.Sc.	1915 ..	Springfield, N.B.
Atilliams, K. F., B.A. '09, B.Sc....	1910 ..	Calgary, Alta.
Atilliams, M. Y., B.Sc. '09, Ph.D..	1912..	Ottawa, Ont.

LIST OF STUDENTS.

1901-1902
FIRST YEAR.

Name.

Address.

Beevor, V. S.	Bromley, Eng.
Boehmer, H. C.	Berlin, Ont.
Bonham, R. L.	Jerseyville, Ont.
Buss, J.	Mille Roches, Ont.
Circle, J.	Kingston, Ont.
Croskery, G.	Kinburn, Ont.
Embury, W. J.	Belleville, Ont.
Farquharson R. J. I.	Toronto, Ont.
Findlay, D. D.	Carleton Place, Ont.
Fleming, M. C.	Owen Sound, Ont.
Gibson, C. S.	Kingston, Ont.
Gordon, J. R.	Kingston, Ont.
Gratton, J. A.	Kingston, Ont.
Hanlon, J. B.	Kingston, Ont.
Hudson, G. W.	Kingston, Ont.
Imblean, T.	Renfrew, Ont.
Isaac, V. W.	Jerseyville, Ont.
Jones, V. C.	Jordan Sta., Ont.
Laframboise, J. P.	Ottawa, Ont.
Luney, O. G.	London, Ont.
Macfarlane, W. J.	Cornwall, Ont.
MacKenzie, G. L.	Ottawa, Ont.
McLeod, G. D.	Kingston, Ont.
Perry, H. B.	Napanee, Ont.
Phillips, R. A.	Ottawa, Ont.
Rumball, K. P.	Niagara Falls, Ont.
Sexsmith, R. L.	Ridgeway, Ont.
Sills, I. L.	Napanee, Ont.
Simmons, C. W.	Kingston, Ont.
Sims, T. A.	Little Current, Ont.
Stauffer, J. S.	Galt, Ont.
St. John, W. J.	Oakville, Ont.
Sutherland, W. G.	Amherst, N.S.
Thorne, E. H.	Providence, R.I.
Tisdale, N. F.	Brockville, Ont.
Wallace, R. F.	North Bay, Ont.
Wedge, J. A.	Drumbo, Ont.
Whittier, A. R.	Ottawa, Ont.
Young, P.	Owen Sound, Ont.

SECOND YEAR.

Bysshe, G. T.	Ottawa, Ont.	Mineralogy & Geology.
Cameron, A.	Orangeville, Ont.	Electrical.

Name.	Address.	Course.
Carey, R.....	Goderich, Ont.	Civil.
Chalmers, G. H.....	Smith's Falls, Ont.	Civil.
Corbett, R. F.....	Kingston, Ont.	Electrical.
Elmer, R. M.....	Kingston, Ont.	Civil.
Fahey, J. V.....	Elgin, Ont.	Electrical.
Fleming, J. H.....	Chaffey's Locks, Ont. ..	Chem. & Metall.
Godard, J. S.....	Ottawa, Ont.	Civil.
Goebel, N. J.....	Ingersoll, Ont.	Civil.
Goodearle, H. L.....	Kingston, Ont.	Chem. & Metall.
Greig, J. W.....	Provost, Alta.	Mining.
Hanley, A. C.....	Kingston, Ont.	Electrical.
Johnston, C. M.....	Parry Sound, Ont.	Electrical.
Keon, J. J.....	Sheenboro, Que.	Mechanical.
Ker, M.F.....	Niagara Falls	Civil.
Legault, A.....	Belleville, Ont.	Mechanical.
Marrison, W. A.....	Cataraqui, Ont.	Electrical.
Martin, J. S.....	Hamilton, Ont.	Civil.
Mills, A. M.....	Ottawa, Ont.	Civil.
Mills, W. S.....	London, Ont.	Civil.
Montrose, C. H.....	Melville, Sask.	Electrical.
Monture, G. C.....	Hagersville, Ont.	Civil.
Moore, C. M.....	Hartington, Ont.	Civil.
McConville, C. A.....	Kingston, Ont.	Chem. & Metall.
McIntyre, T.M.....	Renfrew, Ont.	Civil.
McQuire, R.C.....	Parry Sound, Ont.	Chem. and Metall.
Nesbitt, E. G.....	Sherbrooke, Que.	Civil.
Paterson, D. R.....	Galt, Ont.	Civil.
Patterson, D. R.....	Auburn, Ont.	Civil.
Pound, C. G.....	Kingston, Ont.	Mechanical.
Smith, F. M.....	Oak Lake, Man.	Mining.
Sproule, F. A.....	Ottawa, Ont.	Civil.
Stephens, C. B.....	Aurora, Ont.	Electrical.
Tobias, G. A.....	London, Ont.	Civil.
Vincent, G. G.....	Woodstock, Ont.	Mining.
Waterhouse, G. K.....	Kingston, Ont.	Mechanical.
Welch, H. R.....	Ottawa, Ont.	Civil.
Wilson, G. G.....	Clayton, N.Y.	Electrical.
Wright, D. G. H.....	London, Ont.	Mining.
Wright, H. C.....	Ottawa, Ont.	Civil.
Wrong, G.....	Sandwich, Ont.	Civil.

THIRD YEAR.

Allin, M. C.....	Whitby, Ont.	Mechanical.
Anderson, G.....	Niagara Falls, Ont.	Civil.
Bates, H. C.....	Toronto, Ont.	Civil.

Name.	Address.	Course.
Belton, J. R.....	Kingston, Ont.	Chem. and Metall.
Blackburn, A. P.....	Chatham, Ont.	Civil.
Boulton, C. A.....	Galt, Ont.	Civil.
Boyd, C. S.....	Uxbridge, Ont.	Civil.
Brinkman, F. L.....	St. Thomas, Ont.	Civil.
Byron, M. R.....	Ottawa, Ont.	Civil.
Cliff, G. H.....	Portsmouth, Ont.	Mining.
Cooke, N. M.....	Kingston, Ont.	Civil.
Cumming, C. H.....	Cornwall, Ont.	Civil.
Danais, P.....	Baie St. Paul, Que.	Civil.
Donnelly, C. H.....	Kingston, Ont.	Civil.
Drewry, S.....	Smith's Falls, Ont.	Civil.
Ferguson, J. A.....	Spanish Mills, Ont.	Civil.
Finnemore, H. F.....	Paris, Ont.	Electrical.
Garrett, W. G.....	Kingston, Ont.	Civil.
Gauthier, H. A.....	Alexandria, Ont.	Civil.
Holmes, F.....	Kemptville, Ont.	Civil.
Hughson, W. R.....	Kingston, Ont.	Civil.
Jamieson, E.....	Arnprior, Ont.	Mechanical.
Keller, R. L.....	Chatham, Ont.	Special
Kendall, H. C.....	Oakville, Ont.	Electrical.
King, W. W.....	Oakville, Ont.	Civil.
Kinnard, I. F.....	Marshville, Ont.	Electrical.
Knowles, C. W.....	Summerville, Mass.	Civil.
Lawrence, C. V.....	Ottawa, Ont.	Civil.
Light, A. K.....	Kingston, Ont.	Chem. and Metall.
Ludgate, D. J.....	Parry Sound, Ont.	Civil.
Mallory, D.....	Mallorytown, Ont.	Chem. and Metall.
Marshall, I. M.....	London, Ont.	Mining.
Miller, W. C.....	St. Thomas, Ont.	Civil.
Milne, W. C.....	Ottawa, Ont.	Chem. and Metall.
Musgrave, W. B.....	Halifax, N.S.	Civil.
Paoli, A. A.....	Charlottetown, P.E.I.	Civil.
Payne, T. H. L.....	Kingston, Ont.	Mechanical.
Poon, Y. D.....	Hamilton, Ont.	Civil.
Pringle, F. D.....	Hamilton, Ont.	Civil.
Ramsay, D. G.....	Toronto, Ont.	Civil.
Rogers, A. B.....	Gananoque, Ont.	Civil.
Smith, J. H. C.....	Westmeath, Ont.	Mining.
Smith, L. J.....	Westboro, Ont.	Civil.
Snyder, D. R.....	Waterloo, Ont.	Mechanical.
Spence, W. A.....	Ottawa, Ont.	Civil.
VanAmburg, G. O.....	Central Argyle, N.S.	Civil.
Wogan, G. O.....	Ottawa, Ont.	Civil.

Name.	Address.	Course.
Wert, G. D.....	Avonmore, Ont.	Electrical.
Whillans, T. O.....	Hurdman's Bridge, Ont.	Mechanical.
Williams, H. J.....	Kingston, Ont.	Civil.
Wright, J. G.....	Valleyfield, Que.	Civil.
Yates, B. T.....	Cornwall, Ont.	Civil.

FOURTH YEAR.

Barrett, W. G.....	Williamstown, Ont. ...	Civil.
Boggs, O. D.....	Cobourg, Ont.	Mining.
Carnochan, R. K.....	Ottawa, Ont.	Mining.
Dagenais, J. H.....	Morewood, Ont.	Electrical.
Denyes, W. B., B.A....	Morven, Ont.	Civil.
Donevan, F. J.....	Lansdowne, Ont.	Civil.
Farnsworth, R. H....	Coaticooke, Que.	Civil.
Fraser, C. E.....	Brockville, Ont.	Civil.
Fraser, O. B. J.....	Brockville, Ont.	Chem. and Metall.
Hemmerick, G.....	Conestogo, Ont.	Civil.
Hughson, T. L.....	Niagara Falls, Ont. ...	Civil.
Jackson, A.....	Hamilton, Ont.	Civil.
Joslyn, C. E.....	Sintaluta, Sask.	Civil.
Leslie, E.....	Halifax, N. S.	Civil.
Mabee, H. C.....	Kingston, Ont.	Mechanical.
Morgan, S. C.....	Elgin, Ont.	Electrical.
McCallum, A. N.....	Sunbury, Ont.	Mining.
McCarthy, F. W.....	Kingston, Ont.	Civil.
McGillivray, C. A....	New Westminster, B.C..	Electrical.
McLennan, M. T.....	Russell, Man.	Civil.
Nicholson, M. D.....	Goderich, Ont.	Civil.
Orr, W. S.....	Cobourg, Ont.	Civil.
Parrott, J. R.....	Odessa, Ont.	Civil.
Pettingill, E. L.....	Wellington, Ont.	Civil.
Ringsleben, W. C....	Renfrew, Ont.	Mining.
Robb, E. R.....	Quinter, Kansas	Civil.
Roach, D. J.....	Sault Ste. Marie	Electrical.
Rogers, G. R.....	Oakwood, Ont.	Mining.
Slinn, W. H.....	Billings Bridge, Ont. ..	Civil.
Smith, J. G.....	Kingston, Ont.	Civil.
Smith, R. F.....	Trenton, Ont.	Civil.
Stephens, W. E.....	London, Ont.	Civil.
Stewart, J. R.....	City View, Ont.	Civil.
Turner, S. R.....	Peterboro', Ont.	Civil.
Wilkins, C. V.....	Trenton, Ont.	Mechanical.

TIME TABLE—SECOND YEAR.

	VIII.	IX.	X.	XI.	I.	II.	III.	IV.
Mon.	Physics II A.D.E.F.G.	Draw. II A. () Phys. III B.F.G. Sur. II E.	Math. III	Min. II (a) B.C. Min. III (b) A.C. Gen. Eng. I D.E.F.G.	Draw. II A. Anal. Ch. II B.C.D. Sur. III E.	Draw. II A. Anal. Ch. II B.C.D. Sur. III E.	Desc. Geom. A.C. German B. Desc. Geom. D. Phys. II F.G.	Desc. Geom. A.C. German B. Desc. Geom. D. Phys. II F.G.
Tues.	Math. II	Geol. I A.C.E. Anal. Ch. I D. Mech. Eng. IX. F.G.	Math. III (Y)	Min. I A.B.C.D. Anal. Ch. VII E.F.G.	Shopwork I A. Anal. Ch. IV B.C. Anal. Ch. I D. Anal. Ch. VII E.F.G.	Shopwork I A. Anal. Ch. IV B.C. Anal. Ch. I D. Anal. Ch. VII E.F.G.	Shopwork I A. Phys. III B.F.G. Phys. II E.D.	Phys. III B.F.G. Phys. II E.D.
Wed.	Min. II (a) B.C. Phys. II. A.D.E.F.G.	Anal. Ch. III A.B.C. Desc. Geom. E. Mech. Eng. IX. F.G. Anal. Chem. III D.	Anal. Ch. III A.B.C. Desc. Geom. E. Mech. Eng. IX. F.G. Anal. Chem. III D.	Anal. Ch. III A.B.C. Min. V (a) Mech. Eng. IX. F.G. Anal. Chem. III D.	Math. II	Sur. VI A.C.D.F.G. Org. Ch. I B. Draw. II E.	Sur. VI A.C.D.F.G. Org. Ch. I B. Draw. II E.	Sur. VI A.C.D.F.G. German B. Draw. II E.

SECOND YEAR—Continued.

—117—

	VII.	IX.	X.	XI.	I.	II.	III.	IV.
Thurs.	Gen. Ch. II A.B.C.D. Sur. II E.	Gen. Eng. I D.E.F.G.	Math. III	Sur. VI A.C.D.F.G. Org. Ch. I B.	Desc. Geom. ACDEFG	Geol. I A.C.E. Anal. Ch. IV D.		
Fri.	Math. II	Min. II(a) B.C. Min. III(b) A.C. Anal. Ch. III D. Draw. III F.G. Shopwork I. E.	Min. I A.B.C.D. Draw. III F.G. Shopwork I. E.	Min. I A.B.C.D. Draw. III F.G. Shopwork I. E.	Anal. Ch. I A.B.C. Anal. Ch. IV D. Sur. II E. Desc. Geom. F.G.	Anal. Ch. I A.B.C. Anal. Ch. IV D. Sur. II E. Desc. Geom. F.G.	Anal. Ch. I A.B.C. Anal. Ch. IV D. Sur. II E. Desc. Geom. F.G.	Engineering Society
Sat.	Min. Geo. Ex Anal. Ch. IV B.C. Draw. II. D.	Excursions A.B.C.D. Anal. Ch. IV B.C. Phys. II A. Draw. II. D. Draw. III F.G.	E. till Nov. 27th Anal. Ch. IV B.C. Phys. II A. Draw. II D. Draw. III F.G.	Anal. Ch. IV B.C. Phys. II A. Draw. II D. Draw. III F.G.				

TIME TABLE—THIRD YEAR.

	VIII.	IX.	X.	XI.	I.	II.	III.	IV.
Mon.	Ore Dressing A.C.D.	Elec. Eng. I A.D.E.F. Phys. Ch. III Anal. Ch. V C.	Geol. III A.C. Phys. Ch. III Geol. II(b) C.	Gen. Eng. I A. Min. III(b) Phys. Ch. I B.C. Surv. IV E.	Phys. Ch. I B.C.	Phys. Ch. I B.C.D.	Gen. Eng. III A. Phys. Ch. I D. Anal. Ch. V C.	Gen. Eng. III. A. Org. Ch. II B. German C. Phys. Ch. I D. Struct. Eng. III E. Mech. Eng. III F. Phys. IV G. Geol. III Lab. A.C.
	Struc. Eng. III E.	Elec. Eng. III G.	Sur. IV E. Mech. Eng. I (a) II (b) D (a) F.G. (a & b)	Mech. Eng. IV F. Elec. Eng. II G.	Gen. Eng. II D.E.F.G. Geol. III Lab. A.C.	Struct. Eng. III E. Mech. Eng. III F. Phys. IV G. Geol. III Lab. A.C.	Struct. Eng. III E. Mech. Eng. III F. Phys. IV G. Geol. III Lab. A.C.	Struct. Eng. III E. Mech. Eng. III F. Phys. IV G. Geol. III Lab. A.C.
Tues.	Min. IV A.B.C. Ind. Ch. I B.D. Struc. Eng. I E.F.	Mining I(b) Thermo I(a) A.D.E.F.G. Thermo II(b) D.E.F.G.	Geol. II(a) A.C. Org. Ch. I D. Hyd. Eng. I E.F. Geol. II(b) C.	Met. I A.B.D.E.F.G. Org. Ch. I D.	Min. IV A.B.C. Gen. Eng. VI E(b) Surv. V E(a) Mech. Eng. III D. Elec. Eng. III G. Ind. Ch. II F.	Min. IV A.B.C. Gen. Eng. VI E(b) Surv. V E(a) Mech. Eng. III F.D. Elec. Eng. III G. Geol. III Lab. A.C.	Anal. Ch. VI B.C. Gen. Eng. VI E(b) Surv. V E(a) Mech. Eng. III F.D. Elec. Eng. IV. G. Geol. III Lab. A.C.	Anal. Ch. VI B.C. Mech. Eng. III F.D. Elec. Eng. IV. G. Geol. III Lab. A.C.
Wed.	Met. I A.B.D.E.F.G. Min. VI C.	Mech. Eng. VII A.D.E. Elec. Eng. II G.	Geol. V (b) A.C. Gen. Eng. II D.E.F.G.	Mining I A.C. Min. III(b) B. Gen. Eng. VI E.	Min. IV A.B.C. Surv. IV E. Mech. Eng. I (a) II (b) D (a) F.G.	Anal. Ch. IV A. Org. Ch. II B. Ry. Eng. I E. Shopwork I D. Thermo V. F. Phys. IV G.	Anal. Ch. IV A. Org. Ch. II B. Ry. Eng. I E. Shopwork I D. Thermo V. F. Phys. IV G.	Org. Ch. II B. German C. Shopwork I D. Thermo V. F.

THIRD YEAR—Continued.

—119—

VIII.	IX.	X.	XI.	I.	II.	III.	IV.
Economics I	Gen. Eng. I A.	Geol. III A.C.	Anal. Ch. VI B. Ore Dressing A.C.D. Org. Ch. I Ry. Eng. I E. Mech. Eng. IV F. Elec. Eng. III(a)G Elec. Eng. II(b)G	Sur. VII A. Anal. Ch. V B.C. Gen. Eng. III A.D.E.F.G.	Sur. VII A. Anal. Ch. V Geo. I. B. Gen. Eng. III A.D.E.F.G.		
Thurs.	Anal. Ch. V D. Elec. Eng. II G.	Anal. Ch. V B.D. Hyd. Eng. I Phys. IV G.					
	Thermo I (a) A.D.E.F.G. Elec. Eng. I(b) A.D.E.F. Min. III (b) Anal. Ch. VI C. Elec. Eng. III(b) G.	Geol. IV (a) A.C. Geol. II (b) C. Anal. Ch. VI B. Mech. Eng. I (a) II (b) D (a) F.G. Ry. Eng. I E.	Sur. VII A. Anal. Ch. VI B.C. Mech. Eng. I (a) II (b) D (a) F.G. Sur. IV E.	Anal. Ch. IV A. Anal. Ch. V B.D. Anal. Ch. VI C. Str. Eng. I E.F. Elec. Eng. IV G. Indus. Chem. I B.D.	Anal. Ch. IV A. Anal. Ch. V B.D. Str. Eng. I E.F. Elec. Eng. IV G.	Anal. Ch. IV A. Anal. Ch. V B.D. Str. Eng. I E.F. Elec. Eng. IV G.	Engineering Society
Fri.	Mining I A (a) Phys. Ch. I B.C.D.						
	Fire Assay (b) A.C.D. Ind. Ch. I B.D. Eng FldWk. II(a) E. Mech. Eng. III F. Elec. Eng. II G. Survey. V(b) E	Fire Assay (b) A.C.D. Ind. Ch. I B.D. Eng FldWk. II(a) E. Mech. Eng. III F. Elec. Eng. II G. Survey. V(B) E	Fire Assay (b) A.C.D. Ind. Ch. I B.D. Eng FldWk. II(a) E. Mech. Eng. III F. Elec. Eng. II G. Survey. V(b) E				
Sat.							

TIME TABLE—FOURTH YEAR.

	VIII.	IX.	X.	XI.	I.	II.	III.	IV.
Mon.	Org. Ch. III B.	Met. II A.C.D. Org. Ch. V B.	Mining II A. Org. Ch. V B.	Mech. Eng. IV A.D.E.G. Org. Ch. V B. Geol. VI C.	Gen. Ch. III B.D. Phys. Ch. II D.	Gen. Eng. II Gen. Ch. III B.D. Phys. Ch. II D. Munic. Eng. II E Mech. Eng. V F. Mech. Eng. VIIa G. Mech. Eng. VIIb G.	Geol. VIII A.C. Org. Ch. III B. Phys. Ch. II D. Mech. Eng. V F. Mech. Eng. VIIa G. Mech. Eng. VIIb G.	Economics II
Tues.	Org. Chem. V B.	Org. Ch. V Mining I(b) C.	Org. Ch. V Hyd. Eng. I A.G. Ch. Eng. I D. Ind. Ch. I D. Mech. Eng. VI F.	Org. Ch. III B. Geol. VIII A.C. Met. I D. Ind. Ch. I D. Hyd. Eng. II. E. Thermo III F.G.	Org. Ch. V B. Ind. Ch. I D. Mech. Eng. V F. Indus. Ch. II. A.E.	Min. & Met. IV A. Phys. Ch. II B. Mech. Eng. V F. Elec. Eng. V G. Struct. Eng. IV E	Min. & Met. IV A. Phys. Ch. II B. Mech. Eng. V F. Elec. Eng. V G. Struct. Eng. IV E	Phys. Ch. II B. Mech. Eng. V F. Elec. Eng. V G. Struct. Eng. IV E.
Wed.	Min. VI A.B. Org. Ch. V B. Met. I D. Org. Ch. I D. Struct. Eng. II E.	Mining II A. Org. Ch. V B. Ch. Eng. I D. Org. Ch. I D. Munic. Eng. IV. Mech. Eng. V F. Elec. Eng. V G.	Gen. Eng. II A. Phys. Ch. II B.D. Hyd. Eng. II E. Mech. Eng. V F. Elec. Eng. IX X	Mining I C. Met. II A.C.D. Ch. Eng. II D. Mech. Eng. V F. Ry. Eng. II E	Min. & Met. IV A.D. Org. Ch. IV B. Anal. Ch. VI D.	Min. & Met. IV A.D. Org. Ch. IV B. Anal. Ch. VI D. Mech. Eng. V F. Gen. Eng. VI G.	Min. & Met. IV A.D. Org. Ch. IV B. Anal. Ch. VI D. Gen. Eng. IV E. Mech. Eng. V F. Elec. Eng. VI G.	Gen. Ch. III B.D. Mech. Eng. V F. Mech. Eng. V F. Elec. Eng. VI G.

VIII.	IX.	X.	XI.	I.	II.	III.	IV.
Ch. Eng. II D.	Met. II A.C.D. Org. Ch. V B. Ch. Eng. II D. Geo. IX. E. Thermo III F.G.	Bacteriology B. Hyd. Eng. I A.G. Ch. Eng. I D. Mech. Eng. V F. Mun. Eng. III E	Bacteriology B. Mech. Eng. IV A.D.E.G. Org. Ch. I D. Geo. VI C. Mech. Eng. VI F.	Org. Ch. V B. Surv. VII C. Ch. Eng. II D. Ry. Eng. II, III E. Mech. Eng. VI F. Met. III (b) G.	Org. Ch. V B. Surv. VII C. Mining II A. Ch. Eng. II D. Ry. Eng. II, III E. Mech. Eng. V F. Met. III (b) G.		
Milling A.D. Anal. Ch. VIII B.	Milling A.D. Anal. Ch. VIII B.	Milling A.D. Anal. Ch. VIII B. Geo. VII C. Ch. Eng. II D. Struct. Eng. IV E. Thermo IV F. Elec. Eng. VI(a) X. (b) G.	Milling A.D. Anal. Ch. VIII B. Surv. VII C. Ch. Eng. II D. Struct. Eng. IV E. Thermo IV F. Elec. Eng. X G.	Milling A.D. Str. Eng. II E. Thermo IV F. Elec. Eng. opt. G. Ry. Eng. II, III	Milling A.D. Org. Ch. III B. Str. Eng. II E. Thermo IV F. Elec. Eng. opt. G. Ry. Eng. II, III	Milling A.D. Org. Ch. III B. Str. Eng. II E. Thermo IV F. Elec. Eng. opt. G.	Engineering Society
Milling A.D. Anal. Ch. VIII B.	Milling A.D. Anal. Ch. VIII B.	Milling A.D. Anal. Ch. VIII B. Geo. VII C. Ch. Eng. II D. Struct. Eng. IV E. Thermo IV F. Elec. Eng. VI(a) X. (b) G.	Milling A.D. Anal. Ch. VIII B. Surv. VII C. Ch. Eng. II D. Struct. Eng. IV E. Thermo IV F. Elec. Eng. X G.	Milling A.D. Str. Eng. II E. Thermo IV F. Elec. Eng. opt. G. Ry. Eng. II, III	Milling A.D. Org. Ch. III B. Str. Eng. II E. Thermo IV F. Elec. Eng. opt. G. Ry. Eng. II, III	Milling A.D. Org. Ch. III B. Str. Eng. II E. Thermo IV F. Elec. Eng. opt. G.	
Ch. Eng. II (a) D. Fire Assay B.D.	Ch. Eng. II (a) D. Fire Assay (b) B.D. Mun. Eng. E.	Ch. Eng. II (a) D. Fire Assay (b) B.D. Mun. Eng. E.	Ch. Eng. II (a) D. Fire Assay (b) B.D. Mun. Eng. E.	Ch. Eng. II (a) D. Fire Assay (b) B.D. Mun. Eng. E.	Ch. Eng. II (a) D. Fire Assay (b) B.D. Mun. Eng. E.	Ch. Eng. II (a) D. Fire Assay (b) B.D. Mun. Eng. E.	
Thermo III (a) F.G. Mech. Eng. X F.G.	Thermo III (a) F.G. Mech. Eng. X F.G.	Thermo III (a) F.G. Mech. Eng. VIII F.	Thermo III (a) F.G. Mech. Eng. VIII F.	Thermo III (a) F.G. Mech. Eng. VIII F.	Thermo III (a) F.G. Mech. Eng. VIII F.	Thermo III (a) F.G. Mech. Eng. VIII F.	

